JULY, 1946

Orthodontics

EDITOR-IN-CHIEF
H. C. POLLOCK

ASSOCIATE EDITORS

Oren A. Oliver James D. McCoy Charles R. Baker Joseph D. Eby
Paul G. Spencer S. A. MacKenzie Henry F. Hoffman

CONSULTING EDITOR, DENTISTRY FOR CHILDREN
Walter T. McFall

ABSTRACTS AND REVIEWS
Associate Editor, J. A. Salzmann

Office of the Editor: 8022 Forsythe Boulevard, St. Louis
Published by The C. V. Mosby Company, St. Louis

American
Journal of Orthodontics
and Oral Surgery

(All rights reserved)

VOL. 32 JULY, 1946 NO. 7

Original Articles

THE PREVENTION OF THE DECALIFICATION OF ENAMEL DURING ORTHODONTIC TREATMENT

ALEXANDER SVED, D.D.S., NEW YORK, N. Y.

THE decalcification of the enamel surfaces of teeth during orthodontic treatment is one of the undesirable results which is frequently observed after the removal of appliances. In many instances the orthodontist is held responsible for these decalcifications, not only by the public but also by the dental profession in general. If this problem is carefully studied, it will become apparent that the orthodontist must carry a good deal of responsibility, but it will also become clear that by far the greater part of the responsibility rests upon the patient. It is important for us to study this problem in detail, for the prevention of the decalcification of enamel depends upon a full understanding of the conditions under which it may take place.

Decalcifications differ in character, and they appear in different forms on the different parts of the teeth. In the most advanced orthodontic technique, the anterior bands are so constructed as roughly to divide the labial surface of the teeth into the cervical, middle, and incisal thirds (Fig. 1). The middle third is covered by the band, while in the incisal and cervical thirds the enamel of the tooth is exposed to the fluids of the mouth and food accumulations. The incisal third of the tooth seldom becomes decalcified on account of the cleansing action of the incised food; but the middle and cervical thirds represent the danger zones which may be very severely affected. On the lingual surfaces only the part of the tooth covered by the band is usually affected, and on the proximal surfaces decalcifications occur only under loose bands left in position for a considerable period.

Read before the New York Society of Orthodontists, March 4, 1946.

Decalcifications which may occur during orthodontic treatment may be divided into eight classes. This classification does not include those decalcified areas which may be present before the beginning of treatment, for they have an entirely different appearance and they represent a problem for the general practitioner. Here we are concerned only with those decalcifications which are initiated by orthodontic intervention.

Class I decalcifications (Fig. 2) occur on the cervical third of the labial or buccal surfaces of teeth, where the enamel is exposed to the fluids of the mouth and food accumulations. The cervical crescent becomes white and opaque, and frequently the decalcification results in the formation of a cervical cavity. This class of decalcification is caused by the prolonged retention of decomposing food particles over the exposed cervical area. While these areas must be cleaned by the orthodontist at each visit, the prevention of Class I decalcification is entirely in the hands of the patient. Lack of cooperation after repeated notice may be considered a good cause for discontinuing treatment.

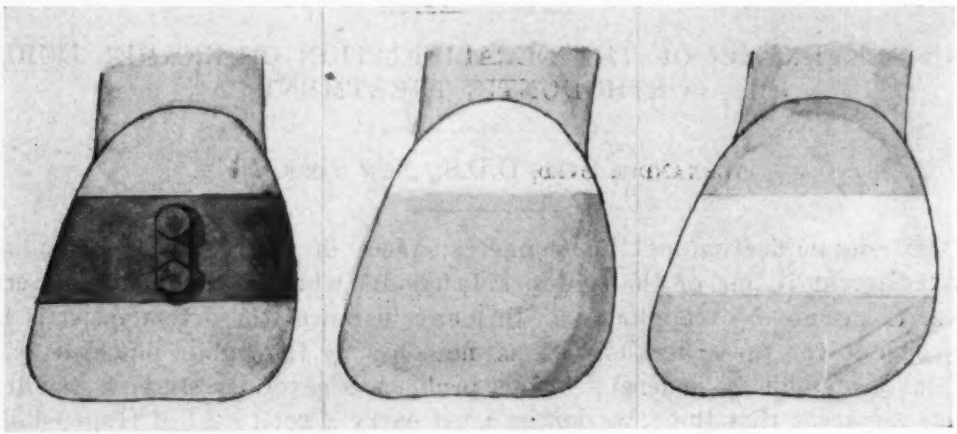


Fig. 1. Fig. 2. Fig. 3.

Fig. 1.—Properly placed anterior band divides the tooth into cervical, middle, and incisal thirds.

Fig. 2.—Class I decalcification.

Fig. 3.—Class II and Class III decalcification.

Class II decalcifications (Fig. 3) occur under bands. Any part of the tooth covered by the band may be effected when a band becomes loose and the cement is dissolved from under it. The fluids of the mouth may carry fine particles of food under the band, or food may be forced under the band during mastication. The decomposition of these food particles brings about the decalcification of the enamel, which becomes white and opaque, frequently covering the entire area covered by the band. If the band is allowed to remain loose on the tooth for a considerable period, the enamel breaks down, with the formation of multiple pits which may coalesce in severe cases. A well-cemented band acts as a protection to the enamel, but a loose band represents the gravest danger. The prevention of Class II decalcifications is entirely in the hands of the orthodontist and he must assume responsibility. It is very

fortunate that this type of decalcification can be kept under control and, as we shall see, does not present a very serious problem to the orthodontist.

Class III decalcifications occur under bands, and they are caused by the chemical action of the phosphoric acid in the cement upon the enamel of the tooth. It appears as a slightly opaque and lighter enamel throughout the entire area which was formerly covered by the band. This class of decalcification is very seldom seen, and may be present in approximately 0.1 per cent of all orthodontic cases. Nevertheless, it is important to differentiate between Class II and Class III decalcifications. The former can be prevented, while the latter is not under our control.[1]

Class IV decalcifications (Fig. 4) occur under bands on the lingual surfaces of the maxillary anterior teeth. They are brought about by the forces of mastication crushing the cement under the band. Frequently this is not sufficient to loosen the band, but seepage may take place and cause decalcification. The prevention of this class of decalcification depends upon the elimination of masticating stresses on the upper anterior bands.

Class V decalcifications (Fig. 5), or etchings, occur at the cervical edges of bands. They appear as a white line following the cervical edge, and are caused by the accumulation of food particles along the edge of poorly constructed bands, or bands made of thick material. Meticulous care on the part of the patient may prevent the formation of this type of decalcification.

Class VI decalcifications (Fig. 6) occur on the lingual surfaces of the maxillary molars and the buccal surfaces of the mandibular molars, along the occlusal edges of the bands. They appear as a mere line or a triangular area under the band, and they are due to the crushing of cement by the occlusal stresses. These decalcifications can be prevented by properly constructed bands. The lingual-occlusal edge of the maxillary molar band and the buccal-occlusal edge of the mandibular molar band must be trimmed low enough to clear the bite. This is extremely important.

Class VII decalcifications (Fig. 7) occur along the cervical and occlusal edges of bands in mouths receiving meticulous care. They appear as fine parallel lines or grooves along the labial surfaces of teeth, and are very similar in character to cervical erosions. These are not true decalcifications but rather represent a type of injury to the enamel which is caused by vigorous brushing. These grooves are polished and do not contain the characteristic white opaque decalcified enamel. It is very possible that the wearing away of the enamel would be more general without orthodontic bands, and that the bands actually prevent the erosion of the areas covered by them. This class of decalcification may be minimized by the less vigorous use of the toothbrush and the choice of a dentifrice which contains the minimum of abrasives. Class VII decalcifications are rarely seen and they are present in less than 0.1 per cent of all orthodontic cases.

Class VIII decalcifications occur under the various kinds of removable bite plates and retaining appliances. They may appear on any part of the teeth

which may come in contact with them, usually on the lingual surfaces. This class of decalcification is always due to the lack of care by the patient, and it can be prevented by proper brushing of the teeth and cleansing of the appliances.

Fig. 4. Fig. 5.

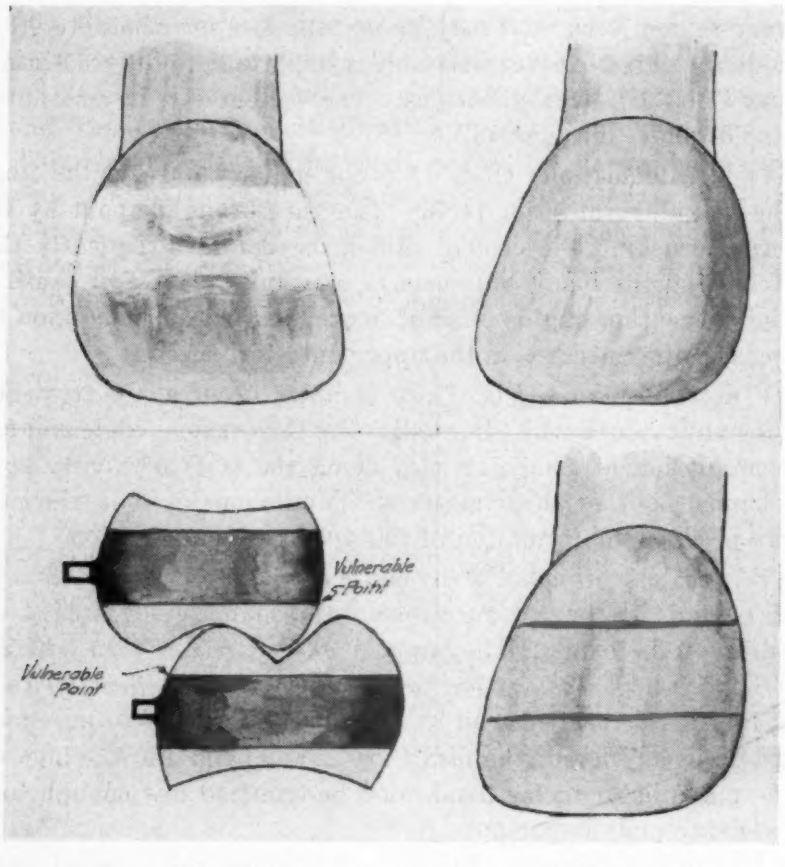


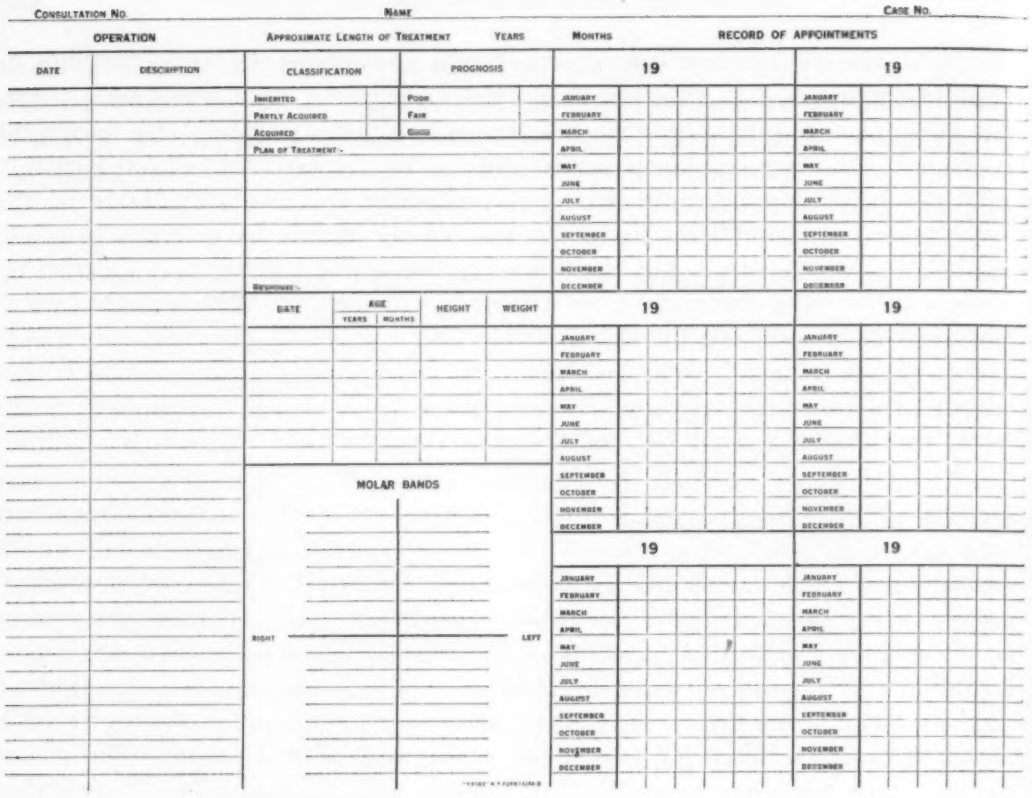
Fig. 6. Fig. 7.

Fig. 4.—Class IV decalcification.
Fig. 5.—Class V decalcification.
Fig. 6.—Class VI decalcification.
Fig. 7.—Class VII decalcification.

From this classification it appears that the successful prevention of decalcifications during orthodontic treatment depends upon a well-coordinated cooperation between the patient and the orthodontist. Since Class I decalcifications occur most frequently, the patient has the greatest responsibility. But this responsibility should be properly placed by the orthodontist. The importance of proper hygiene must be impressed on the patient and the parents of the patient. After instruction is given in toothbrushing, the prevention of Class I decalcifications is entirely up to the patient. The orthodontist cannot prevent it.

With the use of the modern orthodontic appliances the usual methods of toothbrushing are not effective in preventing Class I decalcifications; therefore, the following substitute for the duration of active orthodontic treatment is offered. The cervical third is best cleaned by a horizontal brushing motion with the bristles pointing incisally or occlusally and the main body of the brush placed well under the lip. After the cervical thirds are properly brushed, the bristles are reversed and the spaces between the brackets are cleaned by forcing the bristles under the arch wire from the incisal. With a slight lateral motion those spaces can be very well cleaned. It is also very helpful to suggest to the patient to check the cleanliness of the mouth by inspecting it in a mirror after the final rinsing. Should there be any food remaining on the teeth, the brushing must be repeated until acceptable cleanliness is obtained.

The prevention of Class II decalcifications involves the keeping of accurate records of the cemented bands. These records must show at every visit how long ago each band was cemented on. A well-made band may be left undisturbed on a tooth for twelve months or more, but, as a precaution, approximately every six months it must be recemented. This applies particularly to molar bands, which on account of the heavier material used in their construction may be quite firm on the teeth even though the cement be completely washed away from them. The band material is sufficiently strong to withstand the masticatory forces without the support of the cement. The bands on the other teeth are more likely to loosen than the molar bands, and they must be checked at each sitting. In order to prevent decalcification under the bracket bands they are made of a thin gauge (0.003 inch) precious material. This permits easy adaptation to the teeth, and has the advantage that it cannot remain on the tooth very long without cement. The masticatory forces will destroy the band, and thus decalcification cannot take place. Furthermore, the bracket bands become loose more frequently than the molar bands, and during the year nearly all bands are recemented at least once. Therefore, it is not necessary to remove the bracket bands for recementation except when the records show that they have been on the tooth undisturbed for more than twelve months. It is clear that the prevention of Class II decalcification depends entirely upon the orthodontist, and he must have accurate records to indicate when the bands must be recemented. The system of records to be described is the outgrowth of a simple chart which I used in conjunction with cases treated by plain labial and lingual appliances. The molar band chart was made part of the other records, and it was placed, together with the description of operation, classification, prognosis, and the record of appointments, on the reverse side of the history chart. Fig. 8 shows the history chart and Fig. 9 its reverse side. Here it will be noted that if the dates on which the molar band were cemented on the teeth are properly entered, the status of each band can easily be determined without spending a half hour reading through the records. A considerable part of the space is devoted to keeping the record of appointments, which very clearly shows whether a patient is receiving the right number of appointments, or is being neglected. This is a very important part of orthodontic records, and if canceled and broken ap-



CONSULTATION NO. NAME CASE NO.

OPERATION — APPROXIMATE LENGTH OF TREATMENT YEARS MONTHS — RECORD OF APPOINTMENTS

DATE	DESCRIPTION

CLASSIFICATION: INHERITED; PARTLY ACQUIRED; ACQUIRED

PROGNOSIS: POOR; FAIR; GOOD

PLAN OF TREATMENT:-

OBSERVATIONS:-

DATE	AGE YEARS	AGE MONTHS	HEIGHT	WEIGHT

MOLAR BANDS

RIGHT LEFT

RECORD OF APPOINTMENTS — 19 / 19

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

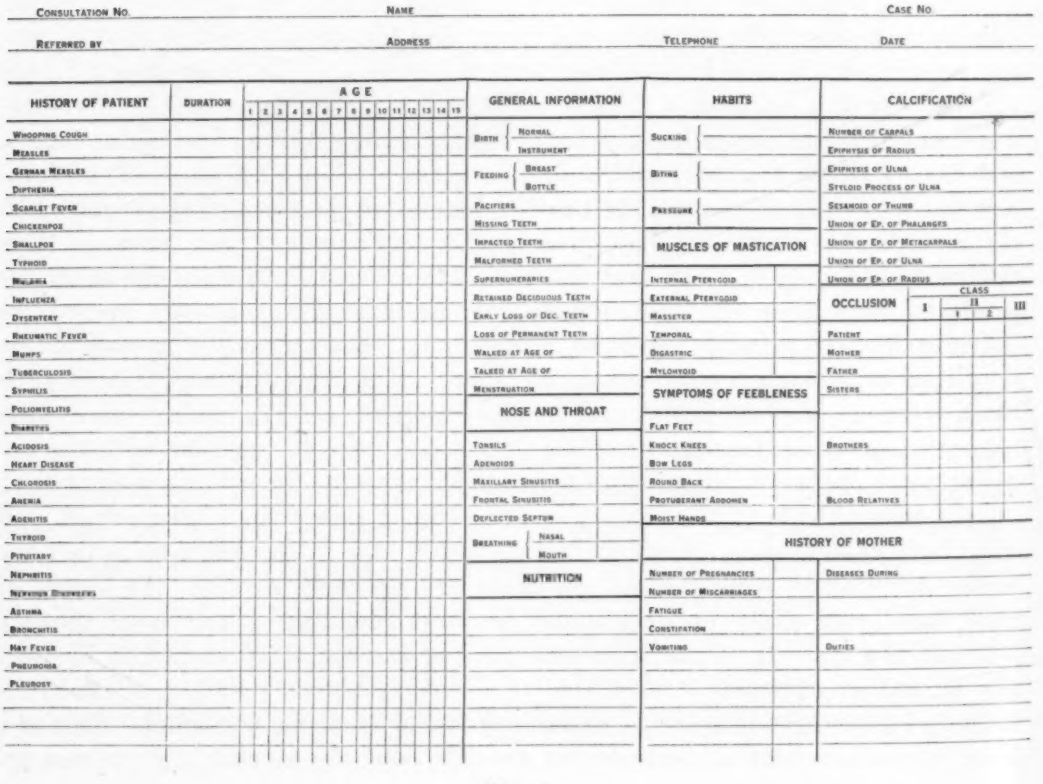
RECORD OF APPOINTMENTS — 19 / 19

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

RECORD OF APPOINTMENTS — 19 / 19

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Fig. 8.



CONSULTATION NO. NAME CASE NO.

REFERRED BY ADDRESS TELEPHONE DATE

HISTORY OF PATIENT — DURATION — AGE 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

WHOOPING COUGH; MEASLES; GERMAN MEASLES; DIPTHERIA; SCARLET FEVER; CHICKENPOX; SMALLPOX; TYPHOID; MALARIA; INFLUENZA; DYSENTERY; RHEUMATIC FEVER; MUMPS; TUBERCULOSIS; SYPHILIS; POLIOMYELITIS; DIABETES; ACIDOSIS; HEART DISEASE; CHLOROSIS; ANEMIA; ADENITIS; THYROID; PITUITARY; NEPHRITIS; NERVOUS DISORDERS; ASTHMA; BRONCHITIS; HAY FEVER; PNEUMONIA; PLEURISY

GENERAL INFORMATION

BIRTH: NORMAL / INSTRUMENT

FEEDING: BREAST / BOTTLE

PACIFIERS; MISSING TEETH; IMPACTED TEETH; MALFORMED TEETH; SUPERNUMERARIES; RETAINED DECIDUOUS TEETH; EARLY LOSS OF DEC. TEETH; LOSS OF PERMANENT TEETH; WALKED AT AGE OF; TALKED AT AGE OF; MENSTRUATION

NOSE AND THROAT

TONSILS; ADENOIDS; MAXILLARY SINUSITIS; FRONTAL SINUSITIS; DEFLECTED SEPTUM

BREATHING: NASAL / MOUTH

NUTRITION

HABITS

SUCKING; BITING; PRESSURE

MUSCLES OF MASTICATION

INTERNAL PTERYGOID; EXTERNAL PTERYGOID; MASSETER; TEMPORAL; DIGASTRIC; MYLOHYOID

SYMPTOMS OF FEEBLENESS

FLAT FEET; KNOCK KNEES; BOW LEGS; ROUND BACK; PROTUBERANT ABDOMEN; MOIST HANDS

HISTORY OF MOTHER

NUMBER OF PREGNANCIES; NUMBER OF MISCARRIAGES; FATIGUE; CONSTIPATION; VOMITING

DISEASES DURING; DUTIES

CALCIFICATION

NUMBER OF CARPALS; EPIPHYSIS OF RADIUS; EPIPHYSIS OF ULNA; STYLOID PROCESS OF ULNA; SESAMOID OF THUMB; UNION OF EP. OF PHALANGES; UNION OF EP. OF METACARPALS; UNION OF EP. OF ULNA; UNION OF EP. OF RADIUS

OCCLUSION — CLASS I; II (1, 2); III

PATIENT; MOTHER; FATHER; SISTERS; BROTHERS; BLOOD RELATIVES

Fig. 9.

pointments are also entered, it may serve as a partial index of the patient's cooperation.

With the use of bracket bands, and especially where all teeth are banded, the keeping of a band chart becomes more involved. For this reason a special band chart was devised which shows, at any time, the status of every band.

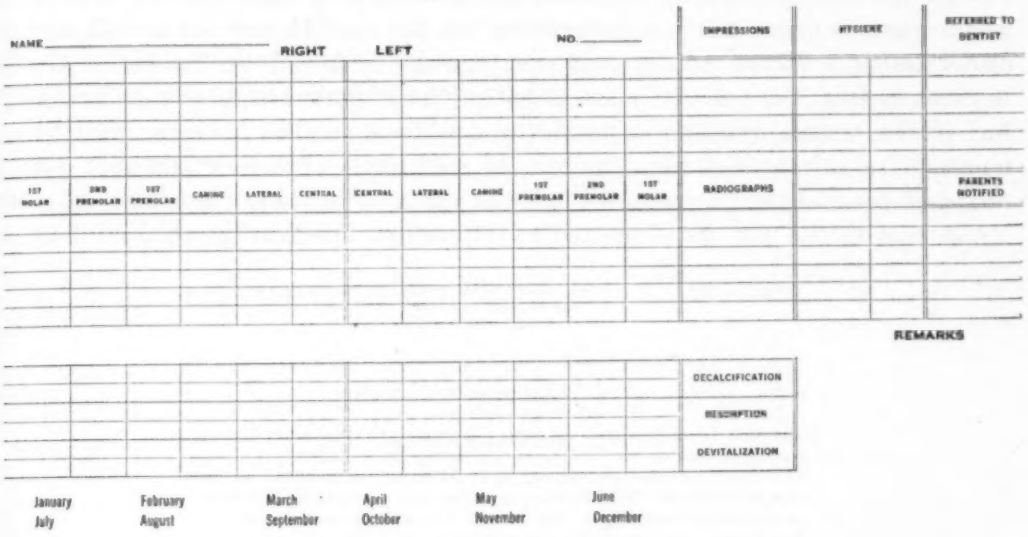


Fig. 10.

Fig. 10 shows such a chart. Above the line in which the descriptions of the teeth appear, are boxes for the dates of cementation for the upper bands and below for the lower bands. The dates clearly indicate when each band was cemented. At the lower edge of the chart is a convenient arrangement of the months of the year. These are so placed in a double row that the months appearing above or below each other are exactly six months apart. A check mark is placed in front of the month in which the appliances are inserted and this serves as a reminder when the molar bands must be recemented. For example, if the appliances are made in May, a check mark is placed in front of May and since November appears directly below May in the chart, the molar bands must be recemented in November and in the following May. In order to guard against errors, these charts are made up in three colors, namely, white, blue, and red. The white charts are used for the first half of the year from January to June inclusive, while the blue ones are used for appliances which are made in the second half of the year from July to December inclusive. This arrangement has the added advantage that during the first half of the year only the blue charts must be watched for recementing, while in the second half only the white ones must be checked. The red charts are used only in those cases where there is a marked predisposition to caries, so that when a red card appears with a patient, a very careful examination of all bands must be made.

It is extremely important to record all decalcified areas which may be present on the teeth before the beginning of treatment, for if it is not done, such

decalcifications will also be ascribed to orthodontic appliances. Therefore, appropriate spaces are provided for recording decalcifications, root resorptions, and devitalizations which may be present at the time treatment is begun. Spaces are also provided for indicating when impressions and radiographs are taken during the course of treatment.

In the column headed *Hygiene,* the date of each appointment is entered and a mark is given which is determined by the condition of the mouth at that appointment. These marks may be "good," "fair," or "poor." If the hygiene is fair, the patient is reminded of the importance of proper brushing, but if the mouth hygiene is poor, the condition is shown to the patient by means of a mirror and the dangers of such lack of care explained; also a notice is sent to the parents through the mails (Fig. 11). The date of every notice sent to the parents is entered in the column headed *Parents Notified.*

DR. ALEXANDER SVED
654 MADISON AVENUE
NEW YORK

DEAR_____

THIS IS TO INFORM YOU THAT THE TEETH OF_____
ARE NOT SATISFACTORILY CLEANED. AFTER REPEATED INSTRUCTIONS THE CONDITION OF THE MOUTH IS NOT IMPROVED. THEREFORE. I ADVISE THAT THE BRUSHING OF THE TEETH AT HOME BE SUPERVISED. UNLESS THIS IS DONE DECALCIFIED AREAS ON SOME OR ALL TEETH WILL APPEAR. WHICH EVENTUALLY WILL RESULT IN THE FORMATION OF CAVITIES. PLEASE GIVE THIS MATTER YOUR IMMEDIATE ATTENTION.

SINCERELY YOURS.

Fig. 11.

DR. ALEXANDER SVED
654 MADISON AVENUE
NEW YORK

DEAR DR. _____

THIS IS TO ADVISE YOU. THAT YOUR PATIENT_____
WAS SENT TO YOU FOR THE QUARTERLY EXAMINATION.

PLEASE CONTACT THE PARENTS AND ARRANGE AN APPOINTMENT
THE BANDS WILL BE RECEMENTED DURING THE MONTH OF_____

THANKING YOU FOR YOUR COOPERATION. I AM

SINCERELY YOURS

Fig. 12.

The keeping of these records is invaluable to the orthodontist. They are extremely helpful in the prevention of Class II decalcifications, and by the proper use of these charts they may be entirely eliminated. But Class I decalcifications cannot be prevented except by home care, and an orthodontist who repeatedly notifies the patients and their parents of persistent lack of care must be absolved of further responsibility.

The purpose of this article is to inform the dental profession that orthodontists are not willing to accept the charge that cavities in teeth are formed by orthodontic appliances. They are formed primarily by inadequate home care, and in some instances by failure to recement bands at regular intervals.

But it must be pointed out that decalcifications due to failure to recement bands represent only a small percentage of all decalcifications. While patients are receiving orthodontic care, they must be referred to their dentists for periodic examinations for cavities. The card shown in Fig. 12 is sent to the patient's dentist, and an entry is made in the column *Referred to Dentist.* I regret to say that this phase of the system was not received with very great enthusiasm by the profession, and the patient was returned with the statement that examination of the teeth was not possible until all bands were removed. While in isolated cases some bands must be removed for a thorough examination, the removal of all bands every time the patient is referred to the dentist is not practicable. For this reason the reminders to dentists were discontinued in my practice, and the teeth are examined for cavities whenever bands are recemented.

654 MADISON AVE. RE 4-8390

M._____

HAS AN APPOINTMENT WITH

DR. ALEXANDER SVED

ON THE_____OF EACH MONTH

AT_____A.M. P.M.

THE EXACT DATES ARE GIVEN ON THE REVERSE SIDE OF THIS CARD. PLEASE DO NOT CHANGE THESE APPOINTMENTS UNLESS IT BECOMES ABSOLUTELY NECESSARY.

Fig. 13.

SEPT._____	JAN._____	MAY_____
OCT._____	FEB._____	JUNE_____
NOV._____	MARCH_____	JULY_____
DEC._____	APRIL_____	AUG._____

ONE HOUR OR MORE IS RESERVED FOR EVERY APPOINTMENT. IF BROKEN, TIME FOR ANOTHER APPOINTMENT AFTER SCHOOL HOURS MAY NOT BE AVAILABLE.

Fig. 14.

In a poorly conducted orthodontic practice it is very possible to overlook a patient who happens to break an appointment without notice. If the appointment book is depended upon for future appointments, such patients are off the book and may go without treatment for several months. To avoid such oversight, whenever an appointment is broken the patient is called by telephone and a new appointment is arranged; also, a thorough card system is kept of all appointments. To prevent overcrowding on any one day, appointments are made for several months in advance. These advance appointments

are entered in the appointment book, and a card (Figs. 13 and 14) is given to the patient with the exact dates. This reserves time after school hours for every patient. If, however, an appointment is broken, it may become necessary to arrange another appointment during school hours, and the patient must be kept out of school. In addition to the card given to the patient, a reminder is sent out a few days before the appointment, thus confirming the hour and the day.

SUMMARY

1. Decalcifications occurring during orthodontic treatment differ in character from those which are present before the beginning of treatment.

2. Decalcifications which may occur during orthodontic treatment can be divided into eight classes.

3. Many such decalcifications can be prevented.

4. Class I decalcifications can be prevented only by proper home care. The orthodontist must stress the importance of such care but cannot prevent Class I decalcifications. That is entirely in the hands of the patient.

5. Class II decalcifications can be prevented by the periodic recementation of bands.

6. Class III decalcifications cannot be prevented.

7. Class IV decalcifications may be prevented by careful examination of the maxillary anterior bands for looseness. They must be recemented whenever they appear to be partially loose.

8. Class V decalcifications are prevented by proper home care.

9. Class VI decalcifications can be prevented by properly constructed molar bands.

10. Class VII decalcifications seldom occur. They cannot be prevented, for they cannot be recognized until the process is well advanced.

11. Class VIII decalcifications can be prevented by proper home care.

12. The dental profession must be fully informed of the fact that orthodontic appliances do not cause decalcifications of the teeth. The greatest percentage of decalcifications is caused by accumulations of food particles on surfaces not covered by hands. The prophylactic care of those areas is the patient's responsibility.

REFERENCE

1. Lefkowitz, William: Histological Evidence of the Harmful Effect of Cement Under Orthodontic Bands, J. D. Research 18: 264, 1939.

654 Madison Avenue

DISCUSSION

Dr. J. A. Salzmann.—Dr. Sved has presented a very fine paper. I do not think for a moment, however, that he intends it to be the sum of all that can be said on the subject.

Susceptibility to caries on the part of the patient is probably more important as a cause of enamel decalcification than anything we do, or the patient can do, to his teeth. When you have a child with a high susceptibility to caries, you have two strikes on you to begin with, as far as prevention of decalcification is concerned. In a way we can tell that at the time we begin treatment. The United States Public Health Service has shown that in children with high caries prevalence we find a greater number of first molars filled.

If you examine a child of 8 to 12 years, and that child shows that he has two, three, or four first molars already filled, you have a priori a child with a high susceptibility to caries even though you do not examine the rest of the mouth.

There are other factors you must take into account, such as genetic influence, dietary influence, and the type of saliva. On the question of saliva, some people hold that the saliva itself has certain inhibitory qualities against caries. I am wondering whether, when we desiccate the surface of a tooth before a band is placed, we are sometimes doing more harm than when we place a band on a tooth which has been cleaned thoroughly and then dried but not desiccated with alcohol and hot air.

Another point on this subject is the use of the fluorides before the bands are cemented.

When decalcification occurs, we cannot simply take all the blame on ourselves, there are other important factors. Furthermore, we should keep in mind the fact that decay will go on regardless of orthodontic treatment. The atypical places where decay will occur in children wearing bands may be due to the fact that they have primarily a high susceptibility to decay.

Dr. L. M. Waugh.—Dr. Sved's analysis is excellent. His record-keeping is important for efficiency. It is a somewhat similar system to the one we have used. However, what Dr. Salzmann has said is also very important. I could not let the record of this meeting go without reiterating that in a study of eleven visits to primitive Eskimos in Labrador, Alaska, and Siberia, we have proved that Eskimo children never have a single decayed tooth, and never a cavity, until they have received sweets. The more highly refined the sweets, the more potent they are for acid fermentation, which is an essential factor for tooth decay. We have promulgated the slogan for popular consumption that an unsweetened tooth cannot decay. That is true. We can prove it. We have taken Eskimos from 40 years to old age, which is usually 58 to 60 years, and given them sweets for a period of six weeks, and in this group of 54 Eskimos, not one of whom previously had even lactobacilli in the saliva, we produced four plus cavities as an average in every mouth. If you tell the children in your practice, as we tell them in ours, that candy is the biggest enemy of their teeth and that they must abstain from eating candy if they would keep their teeth from decay, but that if they eat candy the teeth must be cleansed within five minutes both by brushing and thorough rinsing so that the solution formed is washed from between the teeth as well as from the exposed surfaces, we will do more to reducing dental caries in the mouths of our patients than by any one factor. All the others that have been spoken of this morning are valuable too.

Dr. Henry Klein.—There is the whole question of the complex character of susceptibility that must be considered. Sugars undoubtedly are a factor in caries even among us, but on the average we are differently situated. We know in many instances of people among us who consume considerable amounts of candy, yet have no caries. The moral of the story is that there is room for argument, yes, but there is room for more and newer knowledge and synthesis of what we know and analysis of what we can learn further on this very complicated problem. It is not a matter of mutual exclusiveness, that is, because sugar does it among the Eskimos it can or cannot do it among us. It is rather what can we learn from that fact without excluding other possibilities.

THE TREATMENT OF MALOCCLUSIONS

J. E. Laskin, D.D.S., Cleveland, Ohio

THE aim of this paper is to discuss the treatment of malocclusions employing the adjustable bracket, and to introduce a clamp for rectangular arch-wire therapy, and a bracket bow-string for the rotation of teeth.

These devices are original and new, projecting a simpler and more precise technique. The adjustable locking bracket was introduced in a previous paper[1] and its inherent properties and advantages were described (Fig. 1). No mention was made of the adjustable edgewise bracket, which is a combination of the adjustable cyclinder and the Angle edgewise bracket (Fig. 2).

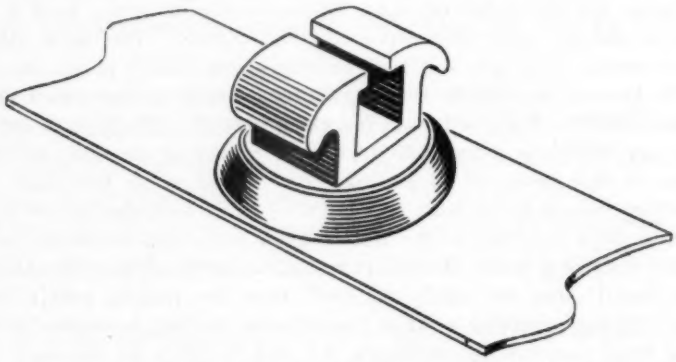


Fig. 1.—Adjustable locking bracket.

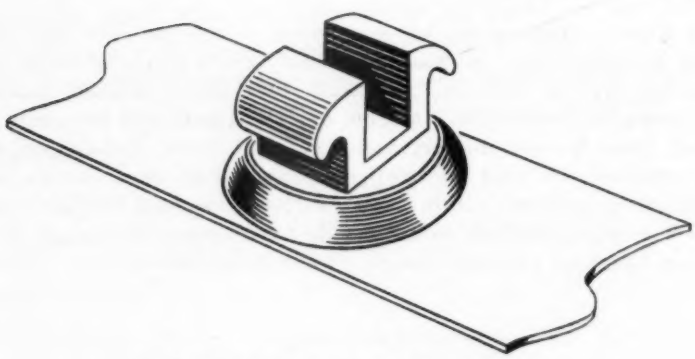


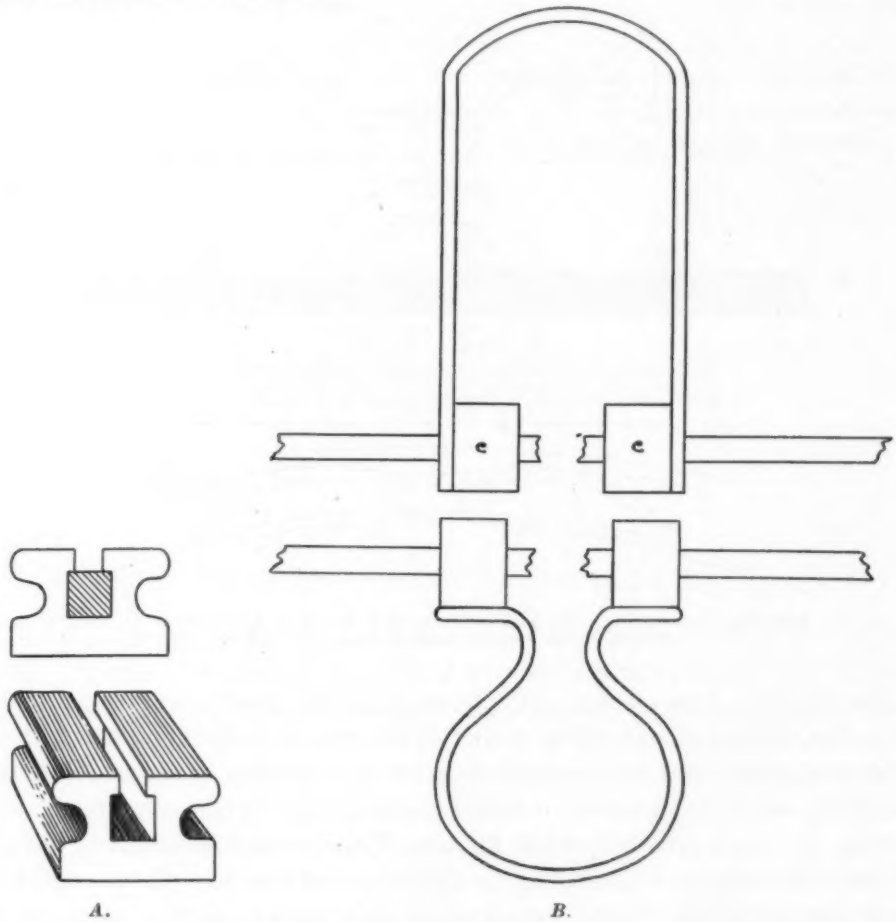
Fig. 2.—Adjustable edgewise bracket.

In this paper, both types of brackets will be used in the assembly, and their respective advantages will be indicated.

The clamp for the arch wire will dispense with the need for soldering to the arch wire such auxiliaries as stops, spurs, staples, intermaxillary hooks, and auxiliary springs (Fig. 3, *A*). The clamp can be placed on the arch wire

at any time during the treatment, without removing the arch wire from the mouth, and it can be removed or its position changed on the arch wire while the assembly lies intact in the mouth.

The clamp will become a stop, a spur, or a staple and can be placed on the arch wire at any point desired without removing the arch wire from the mouth. Intermaxillary hooks, auxiliary springs, and vertical spring loops are fashioned by soldering gold wire to the clamps, ready for use when indicated. Gold wire soldered to the clamp and bent into hooks or springs can be placed on the arch wire at any time during the treatment without disturbing the assembled mechanism in the mouth.



A. *B.*

Fig. 3.—*A*, Clamp. *B*, Vertical spring loops soldered to clamps and placed on the arch wire.

Vertical spring loops, for the opening and closing of spaces in the mouth, are fashioned and bent into the desired form and size. A clamp is soldered to each leg of the loop, and placed on the arch wire at the point indicated for the opening or closing of space. The arch wire between the clamps is removed with a suitable instrument, and a vertical spring loop is ready for the desired action without removing the arch wire from the mouth. We thus eliminate the making of a new arch wire with a spring loop incorporated in its design. (Fig. **3, *B*.**)

Where coil springs are employed to open spaces for a blocked-out tooth, the clamp can be moved along the arch wire to intensify the action of the coil spring. The bracket bow-spring is a spring designed to lock snugly around the wings of the bracket (Fig. 4, *A*). The mesial and distal sides of the bracket bow-spring lie parallel and adjacent to the mesial and distal axial walls of the labial surface of the tooth and will be in frictional contact with the labial surface of the tooth at its mesial and distal extremity (Fig. 4, *B*).

Slight loops are incorporated in the bracket bow-spring, for ligature insertion and traction.

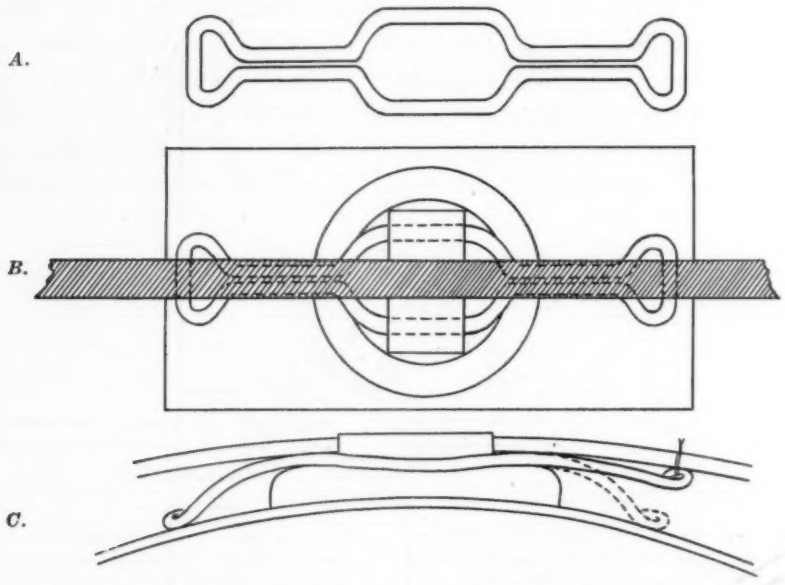


Fig. 4.—*A*, Bracket bow-spring. *B*, Bow-spring and bracket assembly. *C*, Cross section of bracket bow-spring tied to the arch wire.

The bracket bow-spring will prove an ideal mechanism for rotation of teeth. No soldering operation is involved, and it will eliminate the use of staples or springs soldered to the bands for the rotation of teeth. The bracket bow-spring can be placed on a tooth at any time during treatment without removing the arch wire from the mouth. The bracket bow-spring will direct its force, when traction is applied by ligature and ligature pliers, on the entire crown portion of the tooth, rather than on a corner of the tooth as in the use of staples. The force applied on the tooth will be a push-and-pull action; the center of the tooth where the bracket bow-spring is locked to the bracket will be the fulcrum, and the tooth will rotate bodily on its vertical axis (Fig. 4, *C*).

These are new and original mechanisms in the treatment of unbalanced dentures, and their advantages and properties will enhance the operator's service to his patients. There will be less inconvenience to patient and to operator because of the elimination of ligature tying, and certainly there will be less expenditure of chair time at adjustments. A more positive direct

force is now available with the use of the adjustable bracket, and stationary anchorage in single unit or multiple units is readily obtainable.

The clamp changes the fashioning and formulating of arches into a simple task of assembling and placing of parts on the arch wire, and the bracket bow-spring eliminates the staples and springs soldered to bands and also makes it a simple task of assembling and placing of parts to a desired tooth during treatment.

In placing bands on the teeth, the upper and lower central and lateral incisors are banded with adjustable edgewise brackets, the cuspids and buccal segments with adjustable locking brackets, and the anchor molar with an adjustable edgewise rectangular tube. These can be changed to an entire assembly of the adjustable edgewise bracket, with adjustable edgewise rectangular tube, but it is important to emphasize that the upper and lower incisors should always be banded with the adjustable edgewise bracket if torque force is to be fully utilized in the incisor segments.

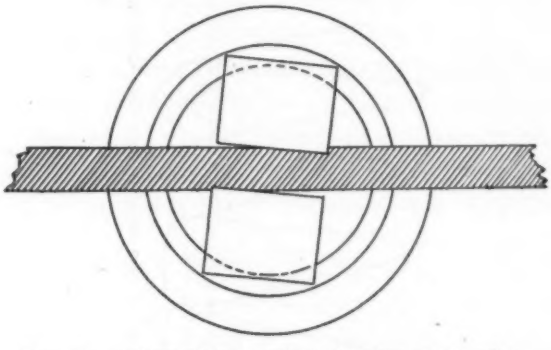


Fig. 5.—Adjustable bracket locking arch wire.

The advantage of the adjustable locking bracket as compared to the adjustable edgewise bracket in the buccal segments is the elimination of ligature ties (Fig. 5), and the intermittent rest periods from rigid mechanical stresses, due to the greater tolerance of the channel of the bracket for the arch wire. The disadvantage, if such it be, is the fact that with the adjustable locking bracket, the tip-back action on the tooth and the torque force must be coordinated, otherwise the torque force is not fully utilized.

In the incisor segments, however, a close tolerance of the channel is desired, to obtain and control torque force without rotation of the bracket cylinder. After the work with small round wires is completed, little or no root and crown movement is necessary in the incisor segments, with the possible exception of a badly rotated incisor. The incisors generally are brought into alignment without need for mesial or distal tipping.

The technique with small-gauge round wires, commonly called the "leveling off process" was discussed in a previous paper[1] as follows:

"The preliminary stages of treatment are confined to reshaping the denture and bringing the arches to that form wherein they will be most receptive to the placement of rectangular arch wires. The 0.016 and 0.018 inch round wires are used only for "leveling off" of the dentures, and very little expansion is obtained with them. The 0.020 inch

round wire which follows them is used: first, to obtain lateral expansion within sound physiologic concepts; second, to reshape the contour of the incisor segments into a flat or less convex outline; third, to upright the badly malpositioned teeth into a harmonious relationship with adjacent teeth; fourth, to bring all bracket channels into the same horizontal plane.

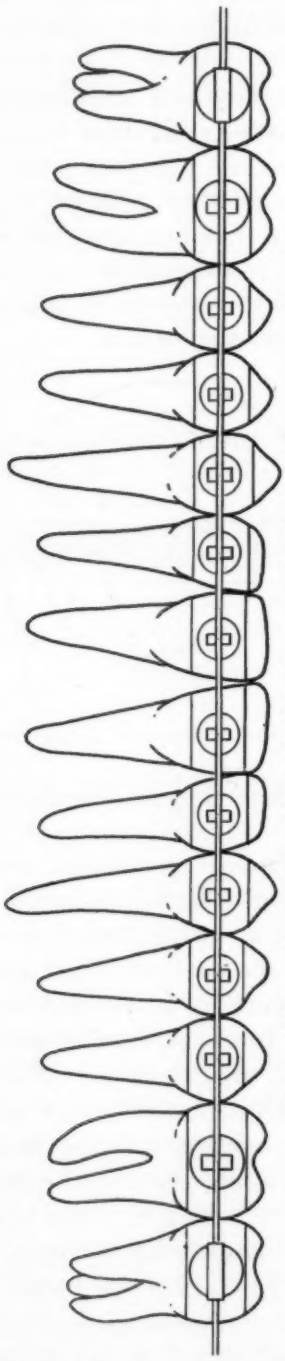


Fig. 6.—The vertical and axial position of the teeth after the leveling off process.

"The distal and mesial tipping of teeth and the expansion required for normal arch form and size as based on patients' charts are obtained with rectangular arches." (Fig. 6.)

TREATMENT OF CLASS I CASE

Mandibular Arch.—In cases where none of the teeth are blocked out of occlusion, a resilient 0.021 by 0.025 inch arch wire is shaped and formed for the lower arch, using the patient's predetermined arch chart, and shaping the arch wire into a working arch form. The arch wire is inserted into the mouth and marked for length, and the bracket markings of all the teeth and the mesial end of the anchor molar bracket are made. The ends of the arch wire should extend 1/8 inch, if possible, beyond the end of the anchor molar bracket. The degree of lateral expansion in the arch wire is noted. Remove the arch wire and incorporate flatness in the incisor area. The buccal segments can have a marked degree of expansion force within biologic concepts. A mild degree of lingual torque force is placed in the incisor area, with this exception that no torque force is placed in the incisor area where the incisors are in marked labial inclination. Harmonized torque force is placed in the buccal segments if necessary. Place the arch wire in the mouth and test for torque force. It is desired in the initial insertion of the rectangular arch that little or no torque force be present. Lingual bends are made at the end of the arch wire to prevent anchor molar rotation. A very slight lingual step bend is incorporated in the arch wire at a point corresponding with the mesial surface of the first molar. The arch wire is tested for symmetry on the patient's chart and for horizontal plane levelness, because all adjustments have been made to the arch, and it is now properly prepared for insertion into the mouth.

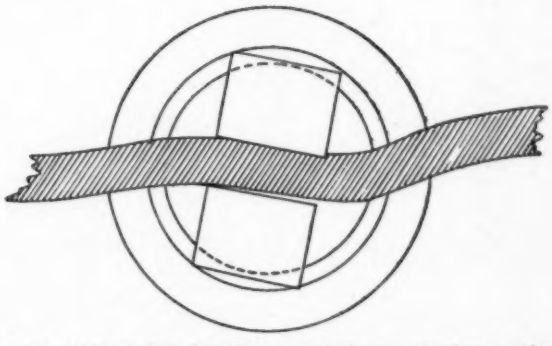


Fig. 7.—Adjustable bracket rotated for tipping action.

The mouth is prepared for the reception of the arch wire. The brackets of the molar, premolars, and cuspids are adjusted to incorporate mild distal en masse movements of the buccal segments (Fig. 7). The angulation of the channels are all placed parallel to each other. The anchor molar bracket is now adjusted to a slightly greater degree of angulation than the bracket mesial to it. The bracket key is used to make these adjustments (Fig. 8). The mouth is now prepared to receive the arch wire.

Clamps are placed on the arch wire at the points which mark the mesial end of the anchor molar bracket. These clamps will be used as stops or tie spurs. Intermaxillary hooks which have been soldered to clamps are placed on the arch wire mesial to the cuspid bracket markings. The arch wire is now ready to be inserted into the mouth.

In placing the arch wire in the mouth, the ends of the arch wire are placed into the tubes of the anchor molar, and the incisor area of the arch wire is raised and placed into the channels of the incisors. The arch wire is forced distally until clamps are in contact with the mesial end of anchor molar bracket. The first molar, premolar, and cuspid areas of the arch wire are seated with the aid of the torquing iron (Fig. 9). The arch wire is securely ligated to the anchor molar to prevent forward migration of the arch wire. The initial step has thus been taken to prepare the mandibular arch for anchorage preparation (Fig. 10).

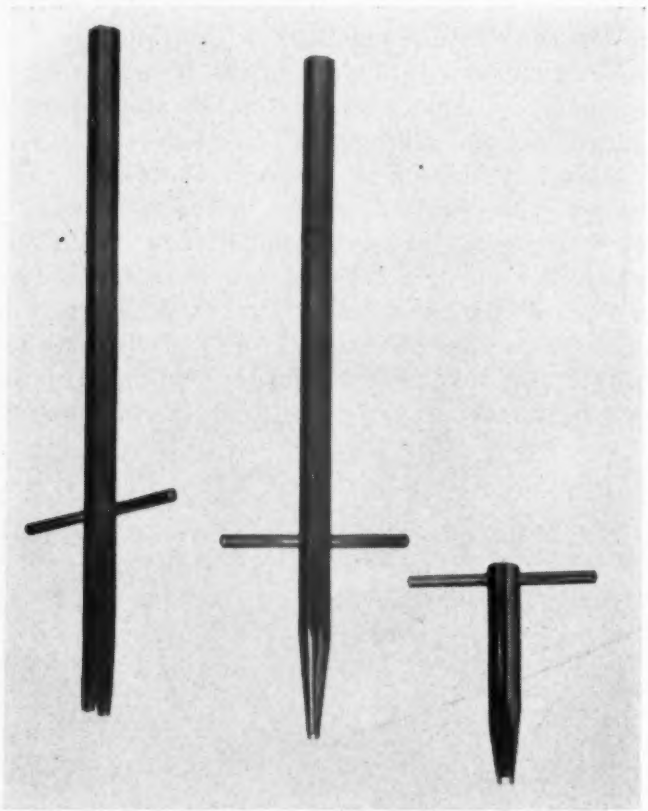


Fig. 9. Fig. 8.

Fig. 8.—Keys for the adjusting of the brackets.
Fig. 9.—Torquing iron for the insertion of the arch wire into the bracket channels.

No adjustment is made to the incisor brackets at this time, unless crown and root movement is necessary; then the brackets are adjusted on those teeth requiring movement as indicated, in a mesial or distal direction. In normally inclined teeth, there is no need for adjusting the incisor brackets to lock the arch wire.

Maxillary Arch.—At the same sitting that the mandibular working arch is placed on the lower jaw, a 0.021 by 0.028 inch stabilizing arch is placed on the upper jaw. An ideal arch is formed using the patient's chart as a pattern. It is placed in the mouth and marked, and all the bracket markings and the

mesial end of anchor molar bracket point are scratched on the arch. Note the degree of lateral expansion. The arch wire is withdrawn and the incisor area is given added flatness, the buccal segments are given lateral expansion force in harmony with the lateral expansion force in the lower arch, slight lingual torque force is placed in the incisor area unless it is contraindicated, and mild lingual torque force is placed in the buccal segments correlated to the lateral expansion of the buccal segments. The arch wire is inserted in the mouth and tested. The arch wire is removed from the mouth and lingual bends are incorporated at the end of the arch wire to prevent rotation of the anchor molars. A lingual step bend is made at a point corresponding with the mesial surface of the first molar. If the arch wire is properly prepared, it is placed on the predetermined arch chart and tested for symmetry and form. It is then tested for horizontal plane levelness. All arches in this technique should be perfectly level before inserted into the mouth and locked into the brackets.

Clamps are now placed on the arch, for molar stops, and for intermaxillary elastics as predescribed. The arch wire is now fully prepared.

The brackets in the mouth are then adjusted. The angulation of the channels of the brackets of the molar, premolars, and cuspids is now adjusted for distal en masse movement of the buccal segments with the bracket key. They should be in parallel relationship to each other, producing coordination in the en masse distal movement. The anchor molar bracket is given a slightly greater degree of angulation than the teeth mesial to it (Fig. 11).

It is understood that the distal movement of the upper, incorporated into the arch wire when locked into the new positions of the bracket channel angulations, is primarily placed to retard the forward or mesial movement of the upper arch when preparing mandibular anchorage in combination with Class III intermaxillaries. Occipital anchorage is also used to prevent and retard the shifting of the upper arch mesially in combination with the other forces mentioned above. The arch wire is inserted into the mouth as previously described, the arch placed in the incisor brackets and in the buccal segments with the arch torquing iron (Fig. 9). The arch wire is now securely ligated to the anchor molar bracket with ligature locking pliers to prevent forward migration. The treatment follows the standard technique in use heretofore: the use of Class III intermaxillary elastics in combination with occipital anchorage on the maxillary arch.

When removing the arch wire from the mouth to increase torque force and lateral expansion force, the brackets are adjusted for increased en masse distal movements before replacing the arch wire in the mouth. When returning the arch wire to the mouth, it is inserted as predescribed and ligated at the anchor molar bracket. In correcting the mandibular arch for desired contour and anchorage preparation, greater torque action is desired, since the arch wire was practically passive at its initial insertion.

Progressive torque in the buccal segments and a mild increase in incisor lingual torque is placed in the lower arch wire. It is tested for symmetry and

flatness in the horizontal plane. Increased distal en masse movements of buccal segments are obtained by increasing the angulation of the channels of the brackets.

The arch wire is placed in the mouth and tested for torque force and expansion force. If increased length of the arch wire is indicated, the clamps at the ends of the arch wire are moved distally to increase length of the arch from anchor molar bracket to anchor molar bracket.

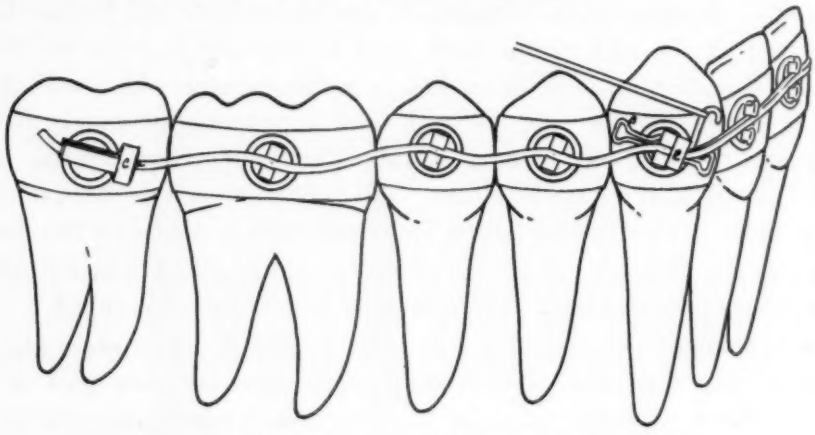


Fig. 10.—Bracket position for distal en masse movement. *B*, Bracket bow-spring. *C*, Clamp.

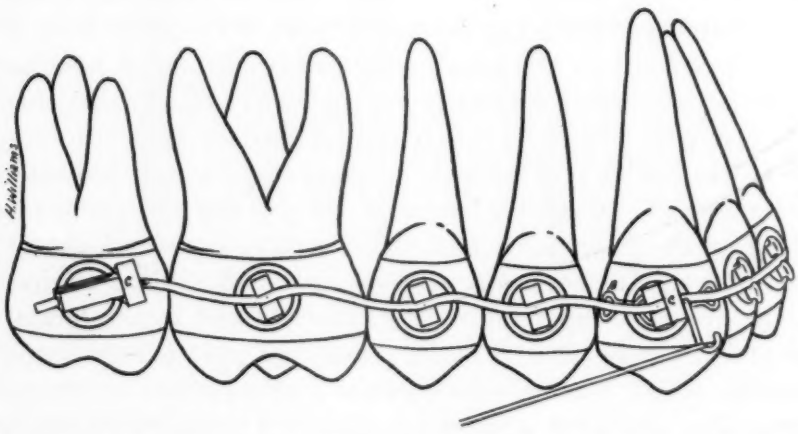


Fig. 11.—Coordinated tip-back action incorporated into the arch wire after insertion into the bracket channels. *B*, Bracket bow-spring. *C*, Clamp.

During this period of treatment as predescribed, a bracket bow-spring is placed on the cuspid tooth. No staples have been placed on the bands. A clamp is also placed on the arch wire, adjacent to and in contact with the first premolar bracket. A ligature is laced to the distal loop of the bracket bow-spring and ligated with the ligature locking pliers to the clamp, to prevent rotation of the cuspid. (Figs. 10 and 11.)

When the required tooth positioning has been obtained and the mandibular anchorage established and carefully checked by close observation, a stabilizing arch of 0.021 by 0.028 inch is fashioned. The stabilizing arch is

made to ideal arch form, guided by the patient's chart, with a flatter incisor segment than in the ideal arch.

The arch wire is inserted into the mouth and checked for expansion force and for length, and the planes of the ribbon side of the arch wire are compared to the lingual slope of the planes of the bracket channels. The arch wire is marked for all bracket markings. The arch wire is removed and adjusted, for passive engagement with the bracket channels.

Harmonized torque is incorporated into the buccal segments and incisal area to correspond with the lingual inclination of the teeth in the denture. A slightly increased lingual torque can be instituted, if it is indicated, by the careful analysis of the lingual tipping position of the tooth or teeth in relationship to the ridge and bone development of the entire denture.

Clamps are placed at the ends of the arch wire for ligature ties to the anchor brackets, and occipital anchor hooks soldered to clamps are placed mesially to the cuspid markings. The bracket slots are not adjusted; only the anchor molar bracket is given slightly greater degree of angulation.

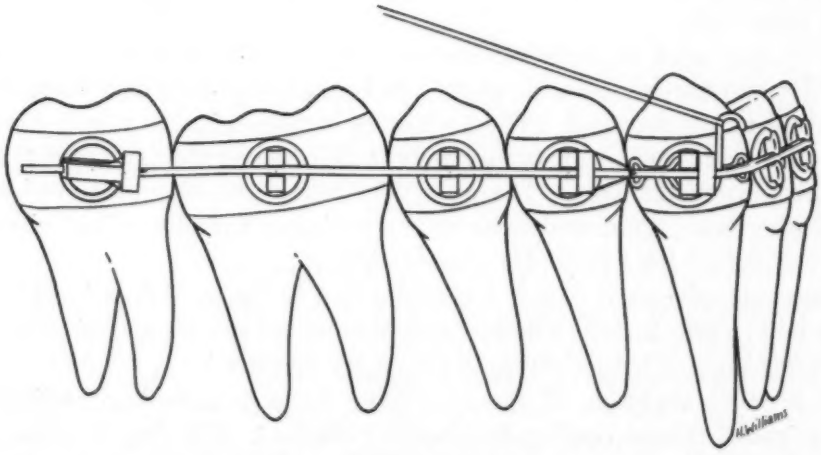


Fig. 12.—Dynamic stationary anchorage (Tweed) established in the mandibular denture, and the assembly as described in the paper.

The arch wire has been tested for symmetry and horizontal plane levelness before the assembling of the clamps on the arch wire. The arch wire is now inserted into the mouth as predescribed and ligated at the anchor molar with ligature pliers (Fig. 12).

In the technique in use heretofore,[2] the stabilizing arch "must have incorporated in its make-up, tip-back bends and lingual torque that absolutely correspond, in degree, with the tip-back bends and lingual torque that is present in the resilient 0.021 by 0.025 inch wire now being discarded. It takes considerable practice to acquire the ability to make this replacement in an accurate manner but such skill can and must be acquired." In this technique, the tip-back bends are eliminated, flat horizontal plane levelness is required, except where the Curve of Spee is incorporated into the arch wire.

Lingual torque is harmonized to the present lingual inclination of the teeth, not to the discarded arch wire, since it is humanly impossible to duplicate in degree tip-back bends and torque without the aid of precision measuring instruments. In this technique it is not required. The author of the textbook from which the above quotation was taken is well aware of the impossibility of duplicating bends and torque in an arch wire in absolute degree. However, I wholeheartedly agree with him in the concept that one should practice and attempt to acquire the skill necessary to make this replacement. Our ideals and goals should always be on the highest plane, our eyes focused on the mountain top, no matter how difficult its attainment. It is almost always advisable to increase slightly rather than to decrease the lingual inclination of the torque force action on the teeth in the arch at this period of treatment.

With the stabilizing arch placed on the lower denture, we are now ready to change the arch on the upper denture to a resilient or working arch. A working arch of 0.021 by 0.025 inch is fashioned, using the patient's chart as a pattern. The arch is placed in the mouth and scratched for the bracket markings, and length of arch wire and the degree of expansion in the arch wire are observed.

The incisor area is flattened, buccal expansion is incorporated, and progressive lingual torque force is placed in buccal segments and lingual torque force in the incisor segment. The arch wire is placed in the mouth and tested. Lingual bends are placed in its make-up at the anchor molar and at the mesial end of the first molar area. The arch wire when properly prepared is tested for symmetry and expansion force on the patient's predetermined chart. The arch wire is tested for horizontal plane levelness.

Clamps are placed at points corresponding to the mesial end of the anchor molar brackets, and intermaxillary hook clamps are placed mesial to the cuspid bracket markings. The arch wire is now fully prepared.

The bracket channels of the maxillary denture have been adjusted previously to resist mesial tipping to Class III elastics. The degree of angulation of the bracket channels is increased for distal en masse movement. The molar and anchor molar brackets are given slightly greater degree of angulation than the bracket channels in the premolar and cuspid teeth. The arch wire is now inserted into the mouth, locked into the brackets as predescribed, and ligated at the anchor molar bracket.

The Class II intermaxillary elastics are prescribed for the patient, with the use of occipital anchorage on the lower arch to enhance and maintain mandibular anchorage. At subsequent adjustments, the arch is treated and adjustments made similar to the treatment now in vogue. (Fig. 13.)

When greater lingual torque force and increased tip-back action is required and indicated, the arch wire is removed and the torque force incorporated into the arch wire.

The bracket adjustment is then made, with the arch wire out of the mouth, and the adjustments of the channels of the brackets are coordinated with the increased buccal torque force and incisal torque force.

Arch-wire length is obtained by simply moving the clamp slightly distally to its former position on the arch wire and locking into position with clamp pliers. The case is treated as outlined in the standard text until the incisors present an incisal edge-to-edge relationship. (Fig. 14.)

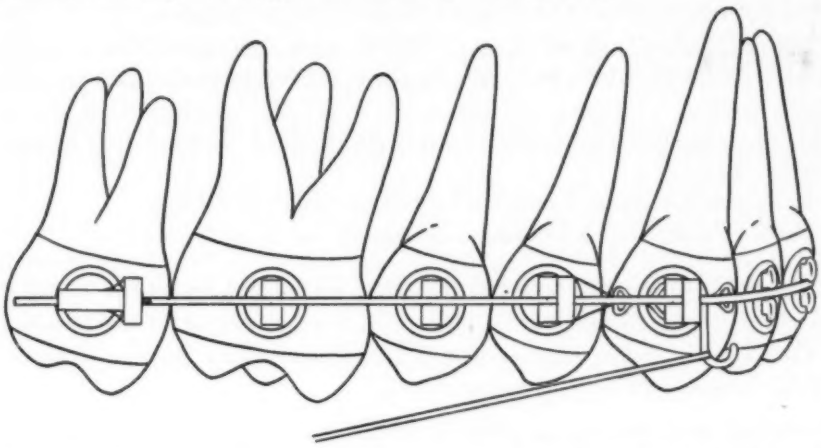


Fig. 13.—The upper denture with required axial relationship of the teeth.

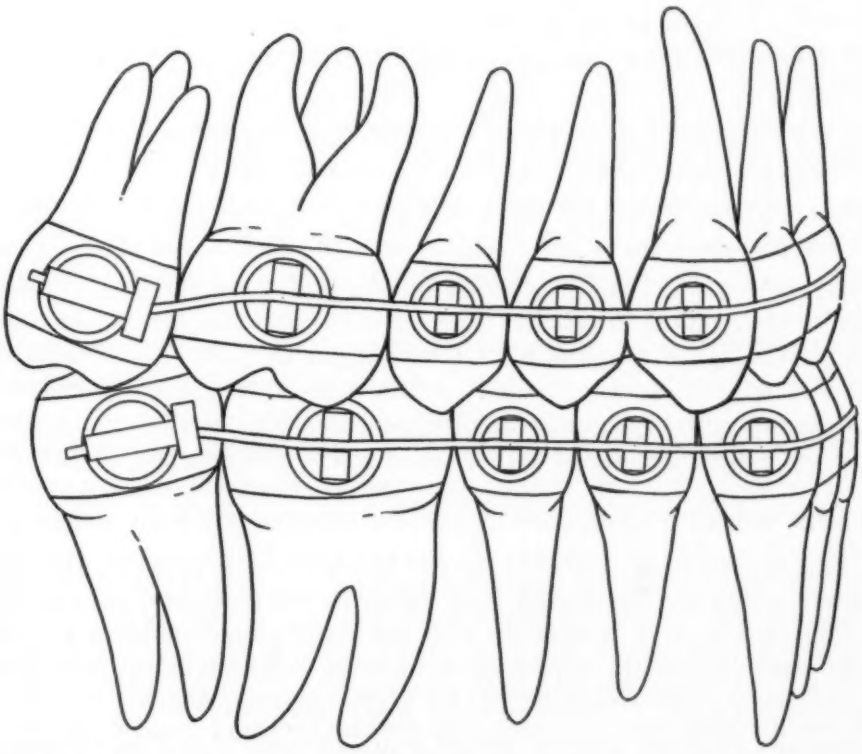


Fig. 14.—The arches in correct relationship with basal bone, showing overcorrection to resist the forces tending to produce a recurrence of the malocclusion.

We have now reached a stage in the treatment when a careful analysis must be made to determine whether the arches and the individual teeth conform to the ideals and standards of present-day orthodontic thought. These

ideals and present-day standards, as compared with "archaic" principles of the past, are:[3]

"1. Each dental arch and every component tooth thereof in correct relationship with its basal bones and coincidentally, with cranial anatomy.

"2. Normal relationship of all occlusal inclined planes of the teeth.

"3. The establishment of an axial position in each dental unit that either is normal or is purposely modified to best resist the forces that tend to produce a recurrence of the malocclusion.

"4. Correct proximal contacting of every tooth which demands the proper rotation of each dental unit.

"5. Balance and harmony in activating and environmental tissues.

"6. Normal growth and development of osseous and muscular structures."

To attain these ideals, normal denture form and inclined plane relationship, and the required axial relationship, it is necessary to insert new resilient 0.021 by 0.025 inch arches on the upper and lower jaws for the detailed finishing and positioning of the individual teeth.

The arches are shaped to ideal arch form, the patient's chart being the blueprint, and harmonized torque is incorporated into the arch wires, correlated to the lingual inclination of the channels of the brackets on the teeth. The arches are tested in the mouth for torque and expansion force. Proper required bends are made as previously described in the buccal segments of the arch wire.

The incisor area of the arch wire is contoured to more nearly the relationship of the predetermined arch form on the patient's chart.

The arches are tested for symmetry and horizontal plane levelness.

Curves of Spee can be incorporated into the arch wires at this time.

Clamps are placed and assembled on the arch wire for ligature tie stops with the anchor molar brackets. The bracket channels are not changed except where the distal tipping of the anchor molar teeth is too severe. The bracket slot angulation is changed on these teeth to upright them slightly. The case is brought to an uneventful conclusion with ideal denture form and normal occlusion and retained with fixed or removable appliances, as indicated.

IN MALOCCULSIONS COMPLICATED BY BLOCKED-OUT PREMOLARS

In malocclusions complicated by the blocked-out premolars, the dentures are treated to attain normal arch form, ignoring the teeth blocked out of alignment. The preliminary treatment with the small-gauge round wires, are followed as described in the standard techniques. The mouth is thus prepared for the insertion of the resilient 0.021 by 0.025 inch arch wire.

When the resilient arch is placed into the assembly, it has incorporated in its make-up a flattened incisor segment, expansion force, and lingual torque force.

The distal en masse movement of the buccal segments is obtained by the adjustment of the bracket slots and intermaxillary elastics. When the denture is prepared for vertical spring loop assembly, the incisors will be on basal

bone, with flattened incisor curve, and the cuspid and first premolar and the molars will be in distal axial inclination with lingual inclination derived from torque force.

At this stage of treatment, we can begin the opening of the space for the blocked-out tooth. Assuming that the second premolar is the tooth out of alignment, a vertical spring loop soldered to clamps, as in Fig. 15, is placed on the arch wire at the area where space needs to be developed.

These vertical spring loops are made by fashioning a gold wire into loop form with Nance pliers. A clamp is soldered to each leg of the spring loop. The loops are fashioned into two types, with the use of Nance's pliers, as in Fig. 3, *B*. The vertical spring loop clamps are placed on the arch wire in the area where space must be developed for the blocked-out tooth, a section of the arch wire is then removed midway between the clamps with a suitable instrument, and a vertical spring loop is thus incorporated into the make-up of the arch wire without removing the arch wire from the mouth.

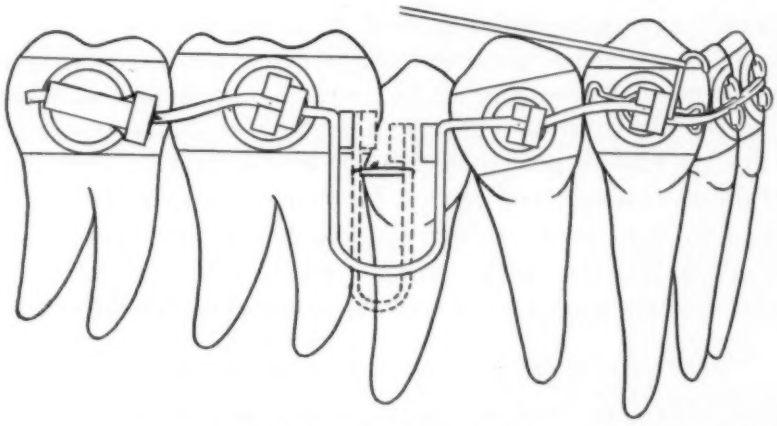


Fig. 15.—The vertical spring loop activated for opening space for a blocked-out tooth. Clamps distal to the spring loop are placed on the arch wire after the loop is contracted and before the ligature tie on the loop is removed.

To activate the spring loop, a ligature is placed around the legs of the vertical loop and the legs of the loop drawn together with the aid of ligature locking pliers. Now that the arch wire has been shortened due to the closing of the loop with the ligature tension, clamps are placed on the arch wire mesially to the anchor molar bracket and first molar bracket, and in direct contact with these molar brackets. The bracket of the first premolar has been adjusted for distal tipping, and a clamp is placed mesially to the first premolar bracket and in contact with it. The first premolar bracket is ligated with a ligature and ligature locking pliers to this clamp mesial to it. The ligature tie around the legs of the vertical spring loop is now cut, and removed and the loop is now in operation. (Fig. 15.)

The above steps in opening of the premolar space will take only a few minutes of chair time and will eliminate the fashioning of a new arch incorporating a spring loop in its make-up. It eliminates the soldering of staples

at the extreme end of arch wires or spurs, soldered distally to the first molar. The clamps placed in contact with the molar brackets will directly bear on the teeth and move them distally as the arch wire assumes its original arch form. The clamp at first premolar will prevent the arch wire from moving mesially and the adjusting of the first premolar bracket for distal tipping action will cause the first premolar crown to tip distally and act as a brake, and thus reduce the mesial pressure on teeth in proximal contact to it. A direct force is thus applied to each tooth distal to the spring loop, which is a tremendous advantage, since the force generated by the loop is equally distributed between the anchor molar and the first molar.

At subsequent appointments, the loop is reactivated by again closing the loop with a ligature and ligature locking pliers. The clamps in contact with molar brackets are replaced distally to proximal contact with the brackets on the molars and locked. The ligature tie on the spring loop is cut and removed and the space development is thus continued until space is derived for the blocked-out second premolar.

Intermaxillary elastic force is used in conjunction with the forces employed in the above space development, to safeguard the positioning of the incisors. A bracket bow-spring on the cuspid can be placed, which in turn is ligated to the clamp already on the assembly, mesial to the first premolar. This ligature tie can be placed if there is any indication that the cuspid is tending to distal rotation, and also to enhance stationary anchorage.

When space has been opened for the blocked-out tooth, a band and bracket is placed on the tooth. A new resilient arch is fashioned for the denture, and the case is continued to completion as in predescribed technique.

CASES OF BLOCKED-OUT TEETH IN THE INCISOR SEGMENTS

In cases where the vertical spring loop is used in incisor segments for gaining lateral width of the denture, the incisors that are blocked out of alignment are the only incisors banded as in the technique heretofore.

Preliminary treatment with round small gauge arches has been completed. The anchorage in the buccal segments has been properly prepared and the resilient arch is in the mouth, locked in the brackets of the buccal segments and canines. Properly prepared anchorage means that the buccal segments have been tipped distally en masse in conjunction with lingual torque force and intermaxillary elastic force. During this preparation, no traction or force has been applied to any incisors. The arch wire is maintained $\frac{1}{16}$ inch labial to the incisors while the anchorage was being prepared in the buccal segments. The arch wire is lengthened during treatment as previously described.

A vertical spring-loop in combination with clamps is now placed on the arch wire in the incisor segment where space must be developed for the blocked-out teeth. The arch wires between the clamps are cut away and the spring is ready for action. (Figs. 16 and 17.) One vertical spring loop is used. (The reason that two loops are shown in the illustrations will be apparent later in the paper.)

The arch wire is now freed from bracket control with the buccal segments and canine but not removed from the anchor molar bracket. Ligatures are tied around the legs of the vertical spring loop and the loop is contracted. The arch wire is maintained $\frac{1}{16}$ inch labially to the labial surface of the incisors, and clamps are placed in contact with mesial end of anchor molar bracket.

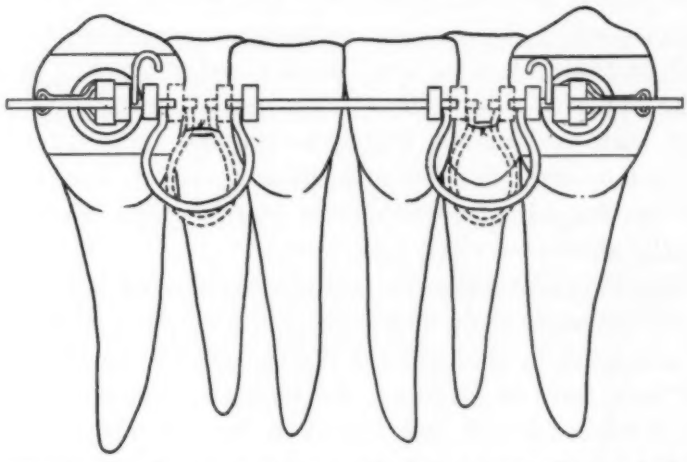


Fig. 16.—The vertical spring loop and clamp auxiliaries for lateral development. Clamps distal to the loops are placed after loops are contracted.

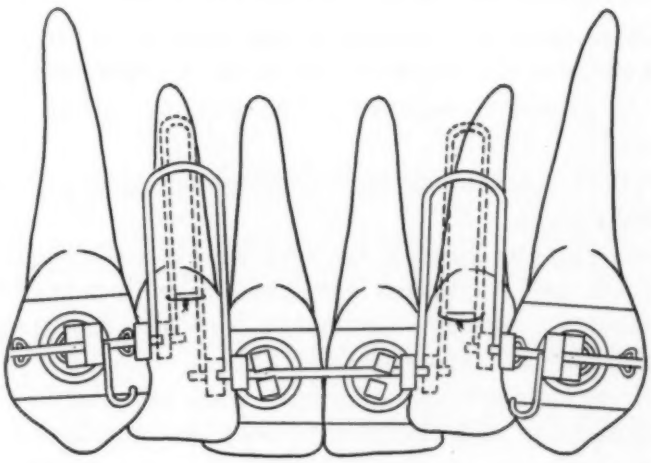


Fig. 17.—The vertical spring loop and clamp auxiliaries for lateral development. Clamps distal to the loops are placed after the loops are contracted.

Bracket control is obtained in buccal segments and canines, and the bracket positions maintain the distally inclined axial positions of these teeth. Clamps are placed on the arch wire, adjacent to and in contact with the mesial surface of the first premolar brackets. Clamps are placed on the arch wire adjacent to and in contact with the mesial surface of the canine brackets. A ligature is tied to the distal loop of the bracket bow-spring on the canines and the clamp in proximal contact with first premolar. This will prevent distal rotation of the cuspids and enhance and aid distal and lateral movement of the cuspids when the vertical loop spring is released.

The blocked-out incisors are now ligated to the arch wire for labial traction. The ligatures tied to the vertical loop for contraction is now cut and removed.

The above-described assembly is very simple and is accomplished in a few minutes. It gives us a perfectly directed force for lateral expansion, very much superior to our present technique. The clamps at the anchor molars, that were placed after the vertical springs were contracted, maintain our desired length of the arch wire from anchor molar bracket to anchor molar bracket on the opposite side. The clamps placed mesial to cuspid brackets, and in contact with the bracket, will move the cuspids in a lateral and distal direction as the loop springs open, and the arch wire is used as a rail for the movement of the cuspid. Intermaxillary elastic force is employed in combination with the above-described technique.

At subsequent appointments the spring is contracted with ligature traction and clamps are moved to their new positions, in contact with their respective brackets. When space is obtained for the blocked-out teeth and bracket control with the arch wire is attained, the normal incisors are banded, a new resilient arch wire is formed and placed in the assembly. The case is continued as in standard technique and brought to an uneventful conclusion.

CASES WITH SLIGHT MESIAL DRIFTING OF BUCCAL SEGMENTS

In cases where there is a definite mesial drifting of the buccal segments, not severe enough or of the degree to fall in the classification of bilateral protrusion cases, the procedure followed is the same as outlined in treatment of bunched incisors:

The incisors are not banded, the levelling off process being obtained with small gauge round wires.

In resilient arch manipulation, the arch wire is maintained $\frac{1}{16}$ inch labial to the incisor teeth, and the buccal segments and canines are moved en masse in distal direction by proper coordinated bracket adjustment, progressive lingual torque, and lateral expansion (Fig. 18).

Intermaxillary elastic force combined with occipital anchorage is also employed in conjunction with the other forces above mentioned.

The clamps at the anchor molar bracket are moved distally to lengthen the arch wire and maintain the $\frac{1}{16}$ inch of space between arch wire and the incisor teeth.

A vertical spring loop is clamped on the arch wire at the median line of the incisor segment and utilized to accelerate the distal shifting of the buccal segments.

The technique is the same as previously described in preceding pages, for blocked-out incisors.

The lateral expansion in the incisor area can be minimized in this type of arch wire adjustment by increasing lingual torque in the cuspids and employing a ligature tie between the distal loops on the bracket bow-spring of the

cuspid and a clamp placed on the arch wire distal to cuspid bracket. This ligature tie will direct the force derived from the vertical spring loop on the cuspid into a distal movement rather than a buccal movement, using the arch wire as a guiding rail. The arch wire is tied at anchor molar brackets to restrain the arch wire from forward migration.

The brackets on the buccal segments are adjusted and maintained in distal en masse movement during the treatment, so that force derived from vertical loop can be directed distally to the buccal segments as well as to the canines. Intermaxillary elastic force in conjunction with occipital anchorage is employed in the above assembly. (Fig. 19.)

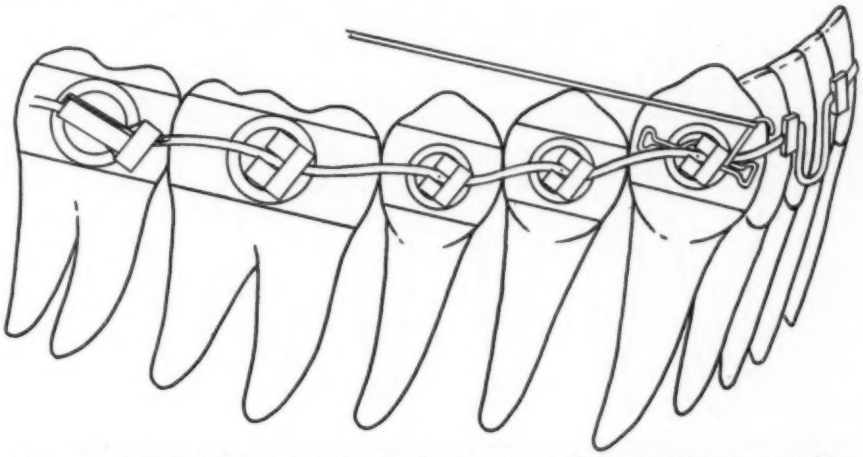


Fig. 18.—Mesial drifting of the buccal segments and the appliance assembly.

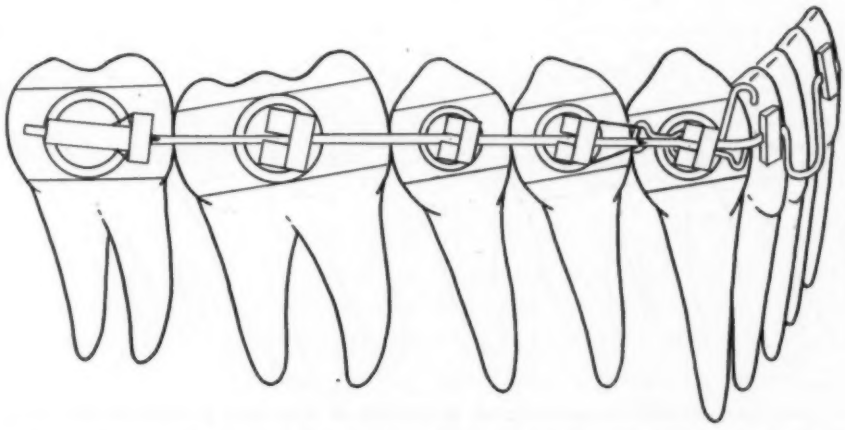


Fig. 19.—The result of the movement of the buccal segments and distal axial inclination of the teeth.

CASES CLASSIFIED AS BILATERAL PROTRUSION

Cases classified as bilateral protrusion are treated as just described, except that in these cases it is advisable to use two vertical spring loops in the incisor segment. These loops are clamped on the arch wire on the incisor segment in the lateral incisor area. No bands are placed on the incisors, and the arch wire is maintained $\frac{1}{16}$ inch labial to the labial surfaces of the incisors.

Both spring loops are contracted by means of ligatures with the use of ligature locking pliers (Fig. 20). After the loops are contracted, clamps are placed mesial to and in direct contact with the brackets of all the teeth distal to the vertical spring loops (Fig. 21). When the ligature ties on the loops are cut and removed, each and every tooth in the buccal segment including the canines will have distal force directed on it.

This distal force derived from the vertical spring loops combined with the force derived by the adjustable brackets, and aided by the force derived from intermaxillary elastics or occipital elastic force, will give us the greatest combination of simultaneously coordinated force, yet devised.

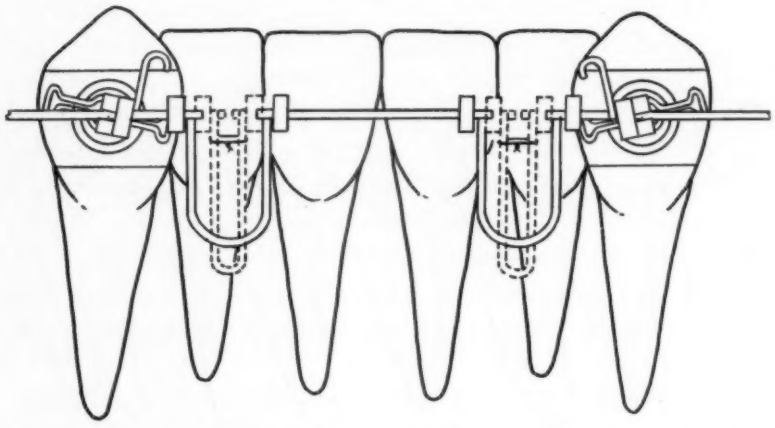


Fig. 20.—The arch assembly in treatment of bilateral protrusion cases.

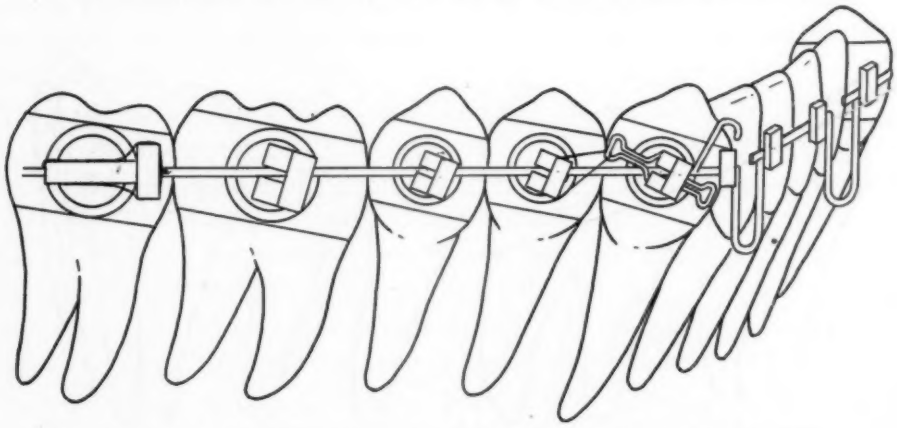


Fig. 21.—The arch assembly in treatment of bilateral protrusion cases.

At subsequent appointments, the loops are again contracted and the clamps changed to their new positions in contact with the brackets as just described. The arch wire is maintained $\frac{1}{16}$ inch labially to the incisors during this treatment period.

When the buccal segments have been shifted distally and their axial inclination uprighted and carried slightly distal to normal axial positioning, the incisors are banded and a new resilient arch is placed in the assembly.

The case is continued to an uneventful conclusion.

USE OF DOUBLE SPRING LOOP FOR BODILY MOVEMENT OF A TOOTH

In the bodily movement or shifting of a tooth with the use of the double vertical spring loops, the resilient arch will be in the assembly, bracket control obtained, the vertical axis of the teeth having been corrected and the mouth prepared for the use of the vertical spring loops.

Assuming that a cuspid needs to be shifted or moved distally to provide space for an unerupted lateral (Fig. 22), vertical spring loops are clamped on the arch wire. One, distally to the tooth to be moved, is placed as close to the first premolar as possible, the distal clamp of the loop being in contact with a clamp placed adjacent to the first premolar bracket. The other loop is placed mesially to the tooth to be moved. The mesial clamp of this loop is placed in contact with a clamp placed adjacent to the central bracket. The vertical spring loop mesial to the tooth to be moved is contracted with a ligature and ligature locking pliers. In closing this loop between central incisor and cuspid, the other loop is automatically opened the identical distance.

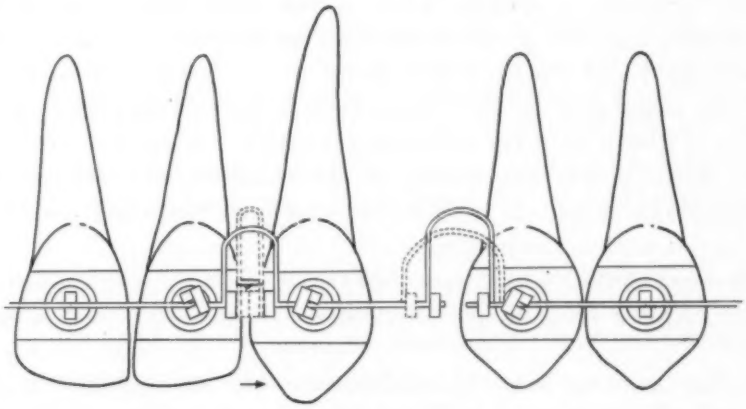


Fig. 22.—The double vertical spring loop adjusted to move the left canine bodily, in a distal direction.

A clamp is now placed on the arch wire mesially to and in direct contact with the cuspid bracket. The ligature tie is cut and removed and the cuspid is directed distally, using the arch wire between the loops as a guiding rail.

The clamps placed on the arch wire and in contact with the brackets of the first premolar and central incisor are stops preventing the shifting of these teeth, which enhance the stationary anchorage. Stationary anchorage on these teeth adjacent to the double vertical loop is further enhanced by adjusting the brackets on these teeth so that there is a slight mesial crown tipping on the central incisor and a slight distal crown tipping of the premolar. The advantage of the double vertical loop lies in the fact that the lever arm of the arch wire between the loops is given more extensive mobility in a mesio-distal direction, it becoming a pendulum swing loop.

At subsequent adjustments, the loop mesial to the tooth to be shifted distally is contracted with the ligature tie and the clamp directing the distal shifting of the cuspid is changed to its new position in contact with the mesial

end of the cuspid bracket. The ligature tie is cut and removed and the arch wire between the loops is thus used as a guiding rail for the cuspid to move distally.

After the tooth is moved to its desired position in the denture, a new resilient arch wire is fashioned and placed in the assembly. The case is continued to an uneventful conclusion.

SUMMARY AND DISCUSSION

Only the fundamentals of treatment have been described and illustrated in this paper. The most common complications in the structural changes required in treatment have been discussed. The changes in this technique, as compared with the edgewise technique now being used, have been noted and illustrated. These changes are of the simplest order and very easily mastered. It is important, however, that a cautious procedure be followed, the changes in angulation of the channels of the brackets being of a very slight degree.

The adjustable cylinder is a turntable. A change in the angulation of the channels will produce a definite wave in the arch wire on insertion into the bracket channels and the pressure exerted on the tooth or teeth will be directionally controlled and positive and direct in its action. In other words, this change in the angulation of the channels and the subsequent force applied to the teeth should be within the orthodontic range. A greater degree of change than noted above in the angulation of the channels will distress the patient, cause a pathologic reaction to the tooth and surrounding tissues, and may cause the loss of anchorage control.

The tip-back action of the teeth en masse should be gradual in its nature and should require two or possibly three very slight adjustments of the brackets.

When the brackets are adjusted to ease the teeth gently in the desired direction, and the arch wire inserted into the channels and bracket control attained, the arch wire should present the appearance of a very shallow, hardly perceptible curved line in the interbracket segments.

The force inserted into the arch wire on bracket control is a direct and positive force and should be respected and treated accordingly.

The technique wherein a series of bends are placed in the arch wire for tip-back action produces a series of lever arms in the interbracket segments. These lever arms are efficient only if they present a change in angulation as compared to the fixed bracket channel angulations. It is highly improbable that more than a 5 to 10 degree difference of angulation exists between the lever arms and the fixed channels.

With the adjustable bracket, the process is reversed, because the angulation of the channels in the brackets are changed, the arch wire remaining in a straight horizontal plane. However, the relationship between the adjusted channels of the brackets and the straight arch wire should not vary more than the 5 to 10 degree change, as used in the former technique, where the arch wire was distorted. I believe that one not acquainted with or not now actively engaged in using the edgewise technique should not attempt to use this refined

method. It is my earnest conviction that the edgewise technique, including the tip-back bends and torque force, should be mastered before the refinements of the adjustable bracket, and the clamp and bracket bow-spring auxiliaries are utilized.

The clamp makes available the assembling of an arch wire without soldering accessories to the arch wire, such as stops, spurs, loops, and hooks. But it does more than that, in that it presents a new fundamental concept in orthodontic thought and technique, namely, the equal distribution of force to teeth, regardless of whether these teeth are in contact with each other or spaced. For example, there is no question but that the force available from Dr. Strang's vertical loops has not been as fully utilized and developed as it might be used and developed, because of the arduous, precise, and complex problem of soldering spurs to the arch wire for the equal distribution of force to each tooth in the segment to be moved. The technique as described in this paper makes frequent use of the vertical loop, either singly or in series because of its inherent and potential source of power, a force that is most efficient and direct. With the clamps used as an accessory to the vertical loop, we have available a device for directional control and the equal distribution of the force derived from the loop to each tooth in the segment to be moved. It seems quite obvious that in the present technique, where loops were used to open spaces and move teeth before clamps were available, the greatest force was executed on the tooth adjacent to the loop. The teeth distal and in contact with each other received some distribution of that force, but in a proportionately minor degree.

In other words, just as Dr. A. G. Brodie reasoned correctly that progressive torque must be placed in an arch wire to equally distribute that torque force, so clamps are used to equally distribute the force derived from the vertical loops as described in this technique.

Nearly four years have been spent in the research and the development of these devices. There were times when the difficulties presented seemingly unsolvable problems. Now the status of these devices is such that the paper can be presented to the profession.

The adjustable cylinder is now perfected to carry pressures far beyond the pressures within orthodontic range. It has inherent in its make-up a large margin of safety against loss of frictional pressure. These cylinders are tested for an ample margin of friction over the requirements before accepted as reliable even though a fraction of that friction is needed for the therapeutic treatment of an individual tooth.

The clamps have been tested and retain their grip on the arch wire, withstanding a direct pull of friction beyond normal requirements.

In conclusion, permit me to state that these devices are presented to simplify a technique; they are not automatic; they require thought and understanding of the principles involved. These devices are refinements in an appliance that is the most efficient appliance at our disposal, an appliance wherein the greatest control of tooth movement and anchorage is available,

an appliance wherein the philosophy of the operator is to move teeth by pressures within orthodontic range to a normal relationship rather than the old-fashioned and out-of-date philosophy of permitting the individual movement of teeth into a normal position.

I wish to thank Dr. B. Holly Broadbent for his cooperation and council during the days of development of these devices. His encouraging and helpful suggestions helped erase many difficulties.

I am extremely grateful to the S. S. White Dental Manufacturing Co. for its cooperation and for fabricating these devices, and especially to the following members of that organization: Dr. Norris Taylor, Mr. Harry Keane, Mr. C. C. Hallowell, and last but not least, Mr. Teamer, who spent so many hours in their development.

REFERENCES

1. Laskin, J. E.: An Adjustable Locking Bracket for Use With Multiple Band Therapy, Am. J. Orthodontics and Oral Surg. 31: 618, 1945.
2. Strang, R. H. W.: Textbook of Orthodontia, ed. 2, Philadelphia, 1943, Lea & Febiger, p. 440.
3. Ibid: p. 415.

858 Rose Building

CEPHALOMETRIC APPRAISAL OF A CLASS I (ANGLE) MALOCCLUSION IN WHICH FOUR FIRST PREMOLARS WERE EXTRACTED AS PART OF THE TREATMENT PLAN

CASE REPORT

BERCU FISCHER, D.D.S., NEW YORK, N. Y.

INTRODUCTION

THE illustrations and graphs used for case analysis at the beginning of treatment and for an appraisal of tooth movement at the end of treatment were obtained from (a) oriented plaster casts, (b) oriented facial photographs, and (c) oriented mandibular roentgenograms.

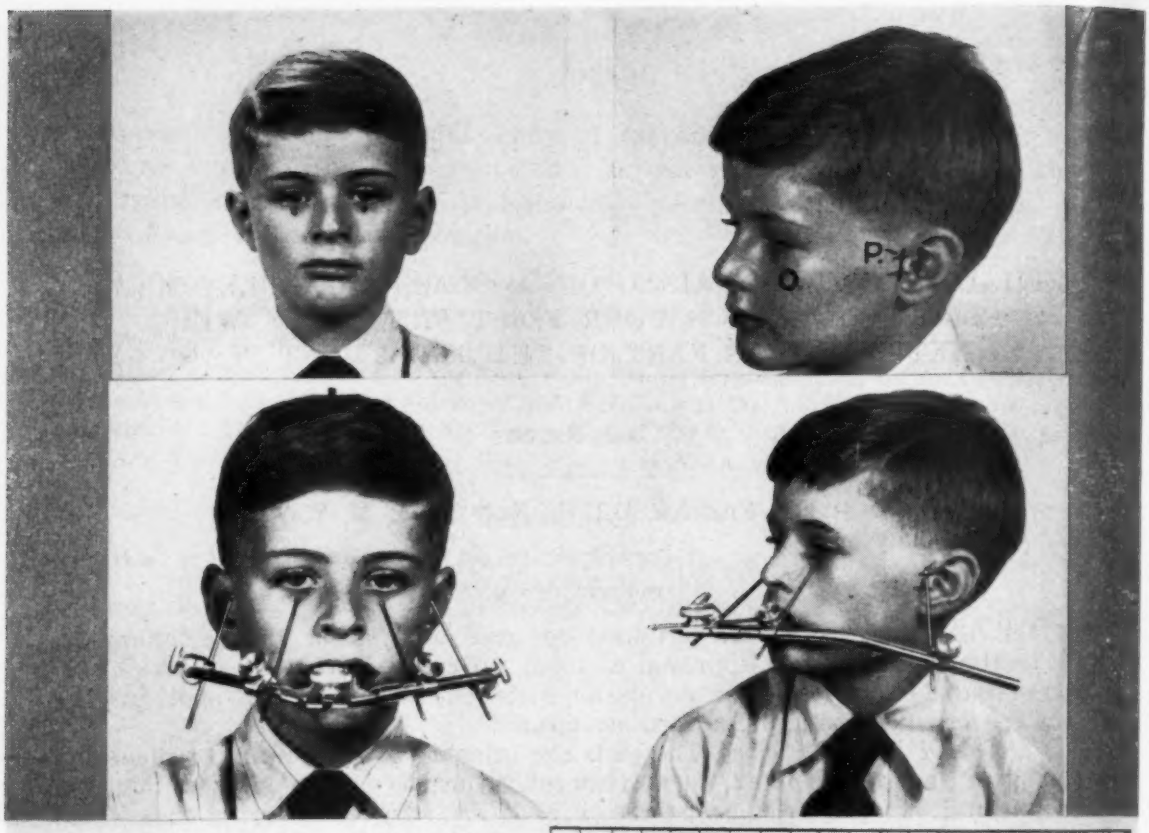
Oriented Plaster Casts.—The casts are oriented to the Frankfort plane by means of the denti-phore,[1] an instrument adjusted on the face to the two orbital and two preauricular points (Fig. 1, *A*). By transferring these four points to graph paper and joining them, we obtain the *Frankfort quadrilateral.* (Fig. 1, *B*) Some of the graphs to be shown are made by projecting the teeth upon this Frankfort quadrilateral. All changes in tooth position in an anteroposterior direction are measured from the base of this quadrilateral or *preauricular plane.* All changes in a lateral direction are measured from the *median plane* which bisects the preauricular plane. Two mandibular casts are made with their bases parallel to the base of the maxillary cast. One of these mandibular casts is sectioned through the middle of the left central incisor tooth along a line parallel to the median plane (Fig. 1, *C*). On this oriented sectioned mandibular cast the *crown axis* of the incisor tooth is determined and prolonged until it cuts the base of the cast (Fig. 1, *D*). The angle formed is the *incisor-axial angle.* Since the base of this cast is parallel to the Frankfort plane, this angle is the angle that the crown axis of the mandibular incisor makes with the Frankfort plane.

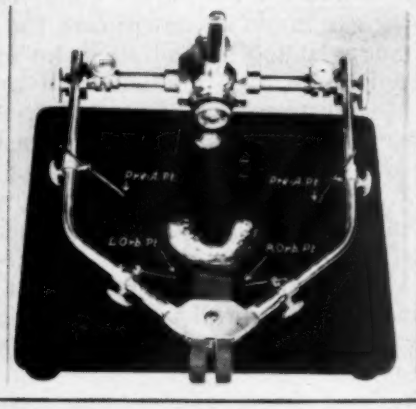
Oriented Facial Photographs.—Profile and front view photographs are obtained with the head of the patient positioned in the cephalo-phore[2] and oriented to the *Frankfort, orbital,* and *median* planes (Fig. 1, *E*).

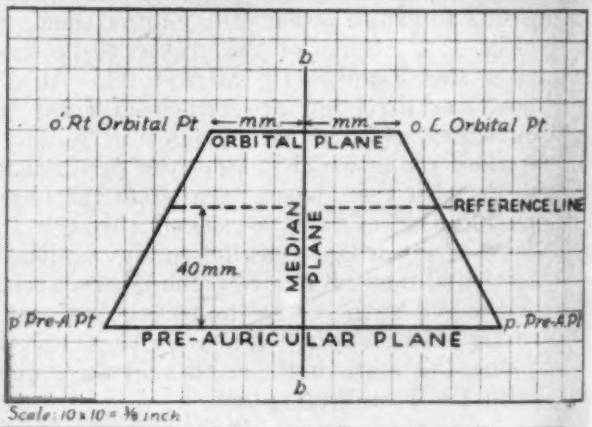
Oriented Mandibular Roentgenogram.—The cephalo-phore is also used to position the head while taking the mandibular roentgenogram.[3] This roentgenogram is taken with the patient biting on a modeling compound block in which is imbedded a portion of a wire previously superimposed upon the incisor-axial line of the sectioned cast. The roentgen ray is directed perpendicular to the median plane of the cephalo-phore. By extending the line of the wire on the roentgenogram until it intersects the lower border of the mandible we get the crown axis of the incisor tooth (Fig. 1, *F*). While the oriented mandibular roentgenogram is used mainly to obtain certain important angular relationships, as described elsewhere,[3] it also serves to show the position of the roots of the mandibular incisors in relation to the labial alveolar plate. It has been pointed out by Kaletzsky[4] that the *root axis* of the lower incisors diverges from the crown axis in a lingual direction, forming the *crown-root angle.* He found that this

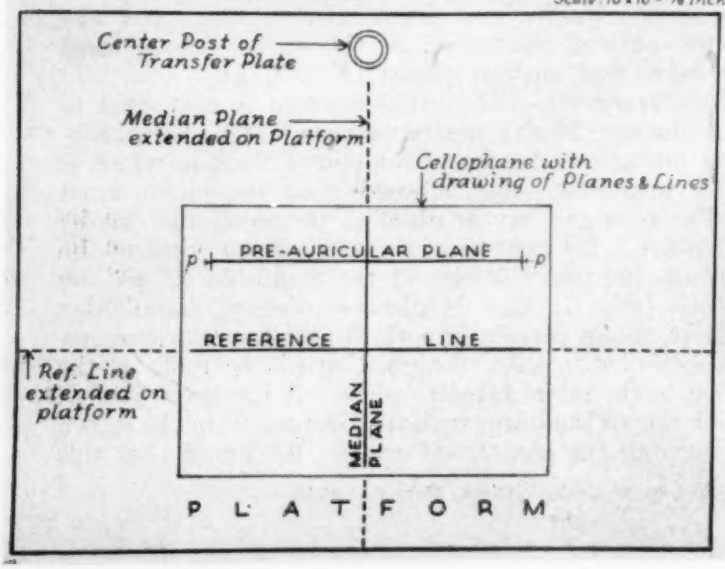
Read before the New York Society of Orthodontists, March 5, 1946.

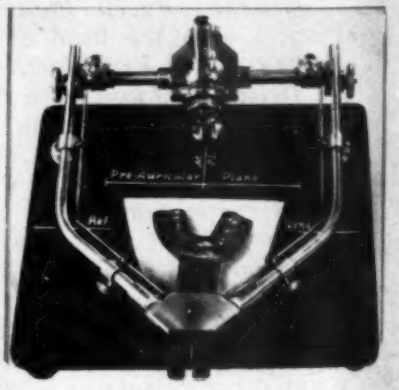
A.





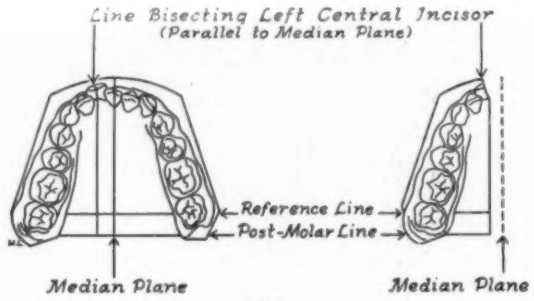




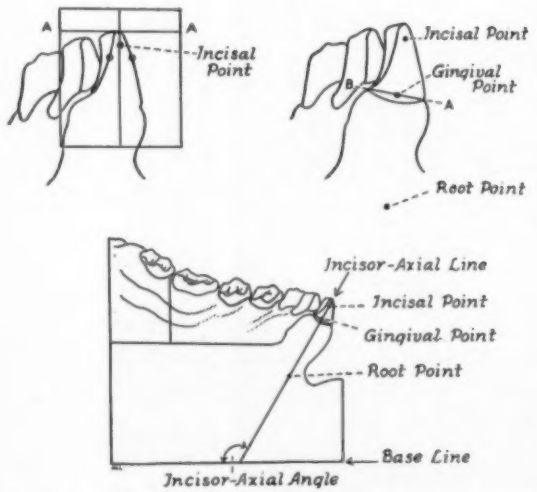


B.

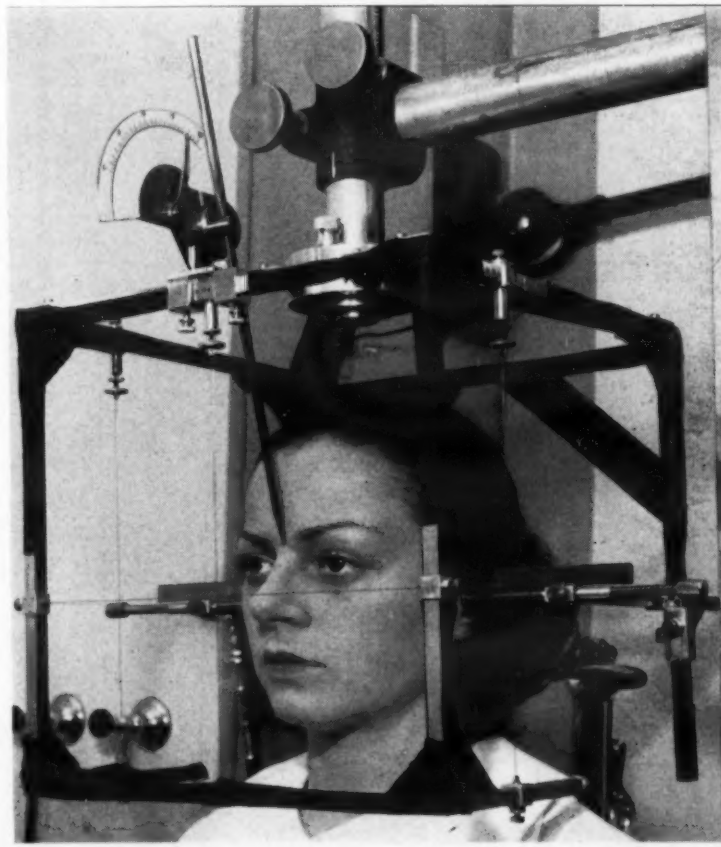
Fig. 1. *(For legend see opposite page.)*



C.



D.



E.

F.

Fig. 1.—*A*, Face-bow of denti-phore adjusted on the face. *B*, Photograph showing complete denti-phore with pointers touching the platform and millimeter graph paper with Frankfort quadrilateral drawn on it. *C*, Mandibular dental cast sectioned along a line bisecting the left central incisor and parallel to the median plane. *D*, Steps in determining the incisor axial angle. *E*, Cephalo-phore in position for photograph. *F*, Oriented mandibular roentgenogram: A-B, crown axis; C-D, root axis; A-O-C, crown-root angle.

angle varies from 5 to 20 degrees and fixed its mean at 7 degrees. We can conclude from the foregoing that the roots of the incisors are always covered with more bone labially than is shown by the position of the crown axis in the roentgenogram.

HISTORY OF THE PATIENT

This girl, white, 11 years of age, was in fairly good health when she presented for treatment. Her health records revealed that the delivery was by cesarean section and that she was bottle fed for four years. She had the following childhood diseases: measles, whooping cough, and chickenpox. The tonsils and adenoids were removed at the age of 8 years. There were no perverted sucking habits as far as could be detected and she was a normal breather.

ORTHODONTIC EXAMINATION

The occlusion showed a Class I molar relationship with considerable crowding of the lower anterior teeth and an abnormal labial inclination of the upper and lower incisors (Fig. 2, *A*, *C*, and *D*). The tongue was normal in size. There was hypotonicity of the muscles. The teeth present were all permanent including the second molars. The facial examination presented a fullness around the lower part of the face and a prominence of the lips (Fig. 3, *A* and *B*). Roentgenographic examination showed that the roots were of normal size and that the third molars were present. There were no missing or supernumerary teeth (Fig. 4, *A* and *C*). It was difficult to connect any of the etiological factors in the case history with the malocclusion present.

OBJECTIVE OF TREATMENT

The general objective was to obtain the *achievable optimum* in (a) functional occlusion, (b) facial balance and harmony, and (c) stability of the finished result; all this to be accomplished with the least possible damage to the tissues involved.

TOOTH MOVEMENTS DESIRED

In order to obtain the achievable optimum as outlined, the following tooth movement was necessary: (a) To reposition the teeth of each arch so that they bear a satisfactory relationship to the supporting bases and to each other. (b) To relate the arches to each other and at the same time maintain them on their respective bases in order not to aggravate the already present facial disturbance.

CASE ANALYSIS

Case analysis which deals with the drawing up of the blueprint of the finished result must also discover the obstacles to be encountered in the execution of the plan. In the case under discussion there are four factors that should be emphasized because they were the basis for the decision to extract four first premolars: (1) The fullness around the mouth as seen in the facial photograph (Fig. 3, *A* and *B*). (2) The protrusive condition of the denture as indicated by the incisor-axial angle of 123 degrees (Fig. 2, *G*). (3) The crowded condition of the mandibular incisors which if regulated without extraction would aggravate the protrusive condition of the lower denture (Fig. 2, *D*). (4) The position of the right and left mandibular third molars which to my mind would be an interference to any attempt at distal movement of the mandibular arch (Fig 4, *C*).

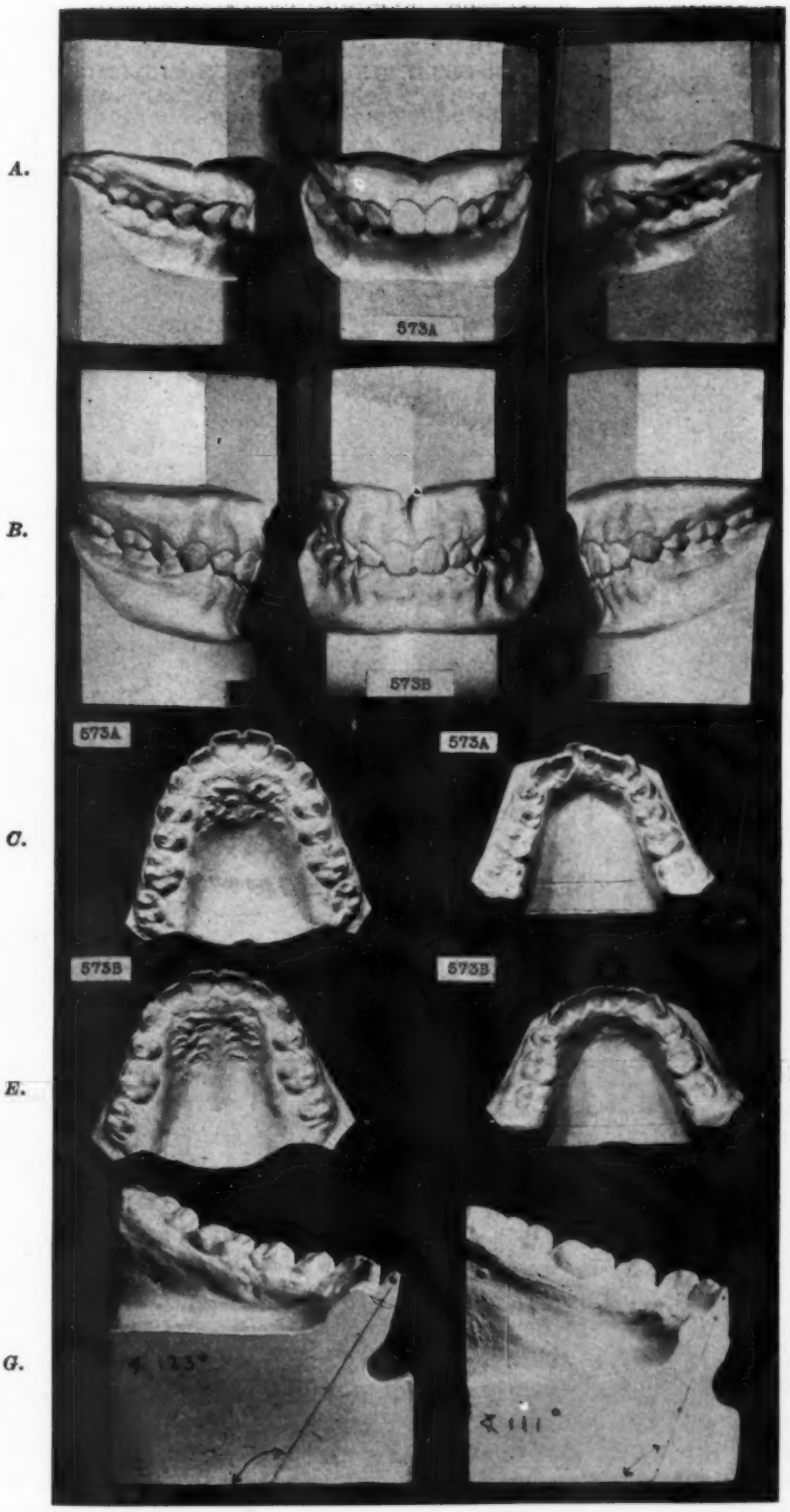


Fig. 2.—*A*, Dental casts before treatment. *B*, Dental casts after treatment. *C*, Occlusal view of maxillary dental cast before treatment. *D*, Occlusal view of mandibular dental cast before treatment. *E*, Occlusal view of maxillary dental cast after treatment. *F*, Occlusal view of mandibular dental cast after treatment. *G*, Sectioned dental cast before treatment. Incisor-axial angle 123 degrees. *H*, Sectioned dental cast after treatment. Incisor-axial angle 111 degrees.

OUTLINE OF MEANS FOR OBTAINING THE TOOTH MOVEMENT

The appliances used were the edgewise and the mechanics followed were those developed by Dr. Charles H. Tweed[5] and taught in this city by Dr. Robert W. Strang.[6]

Treatment Record.—

1943		
April	15	Treatment started.
June	12	The lower first bicuspids extracted.
June	22	The lower sectional arches inserted.
July	5	The upper first bicuspids extracted.
Aug.	19	The upper sectional arches inserted.
Sept.	28	The lower sectional arches replaced with a continuous 0.021 by 0.028 arch with rounded-off anterior segment.
Dec.	18	The upper sectional arches replaced with a continuous 0.018 round appliance.
1944		
Feb.	21	Replaced upper with 0.021 round looped appliance.
March	23	Replaced upper with 0.021 by 0.025 continuous appliance.
June	20	Replaced upper with 0.021 by 0.028 continuous appliance.
Aug.	8	Replaced upper and lower with new 0.021 by 0.028 arches with *midget vertical elastics.*
Oct.	11	Removed all lower appliances and impression taken for lower retainer.
Oct.	16	Inserted lower retainer.
Oct.	25	Removed all upper appliances and impression taken for upper retainer.
Nov.	1	Inserted upper retainer.

RESULTS OF ORTHODONTIC TREATMENT

Fig. 2, *B, E,* and *F* shows casts after treatment.
Fig. 2, *H* shows reduced incisor-axial angle.
Fig. 3, *C* shows front facial photograph after treatment.
Fig. 3, *D* shows profile photograph after treatment.
Fig. 4, *B* shows dental roentgenograms after treatment.
Fig. 4, *D* shows lateral jaw roentgenograms after treatment.

ANALYSIS OF TOOTH MOVEMENT

1. *From the Median Plane.*—(a) *Maxillary and mandibular* arches: The median line of the dental arch which was to the left of the median plane of the head before treatment coincides with this plane at the end of treatment (Fig. 5, *A* and *B*).

2. *From the Preauricular Plane.*—(a) *Maxillary arch:* the spaces of the extracted first premolars seem to have been taken up partially by the six anterior teeth which have moved distally into a wider area and partially by the premolars and molars having moved mesially (Fig. 5, *A*). (b) *Mandibular arch:* the same movement seems to have taken place in this arch (Fig. 5, *B*). The mesial movement of the premolars and molars has created additional space between the second molars and third molars as shown in the lateral jaw roentgenographic plates (Fig. 4, *D*).

3. *The Mandibular Incisor-Axial Angle.*—As shown in the sectioned casts and graphs, this angle has been reduced from 123 degrees before treatment to

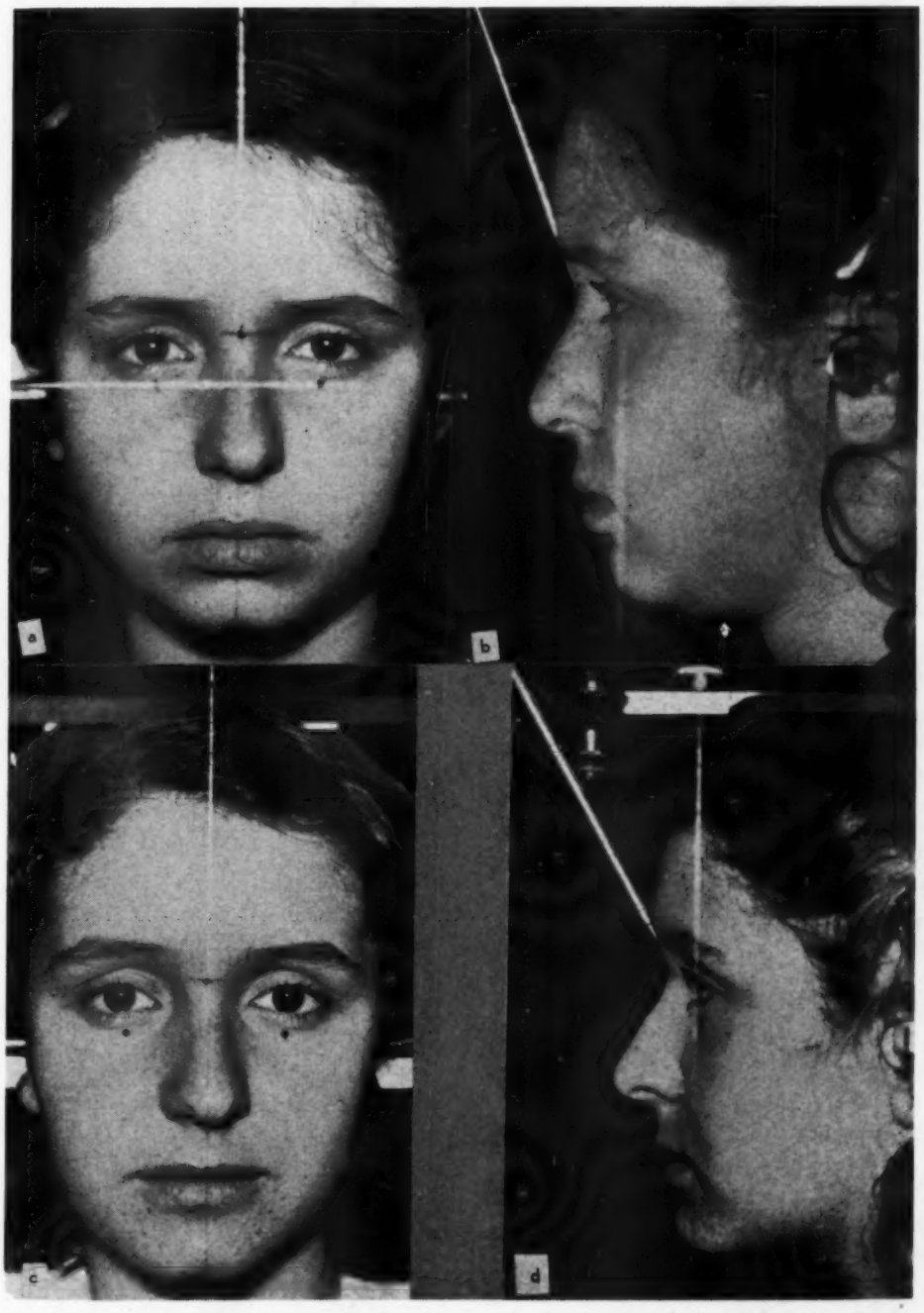
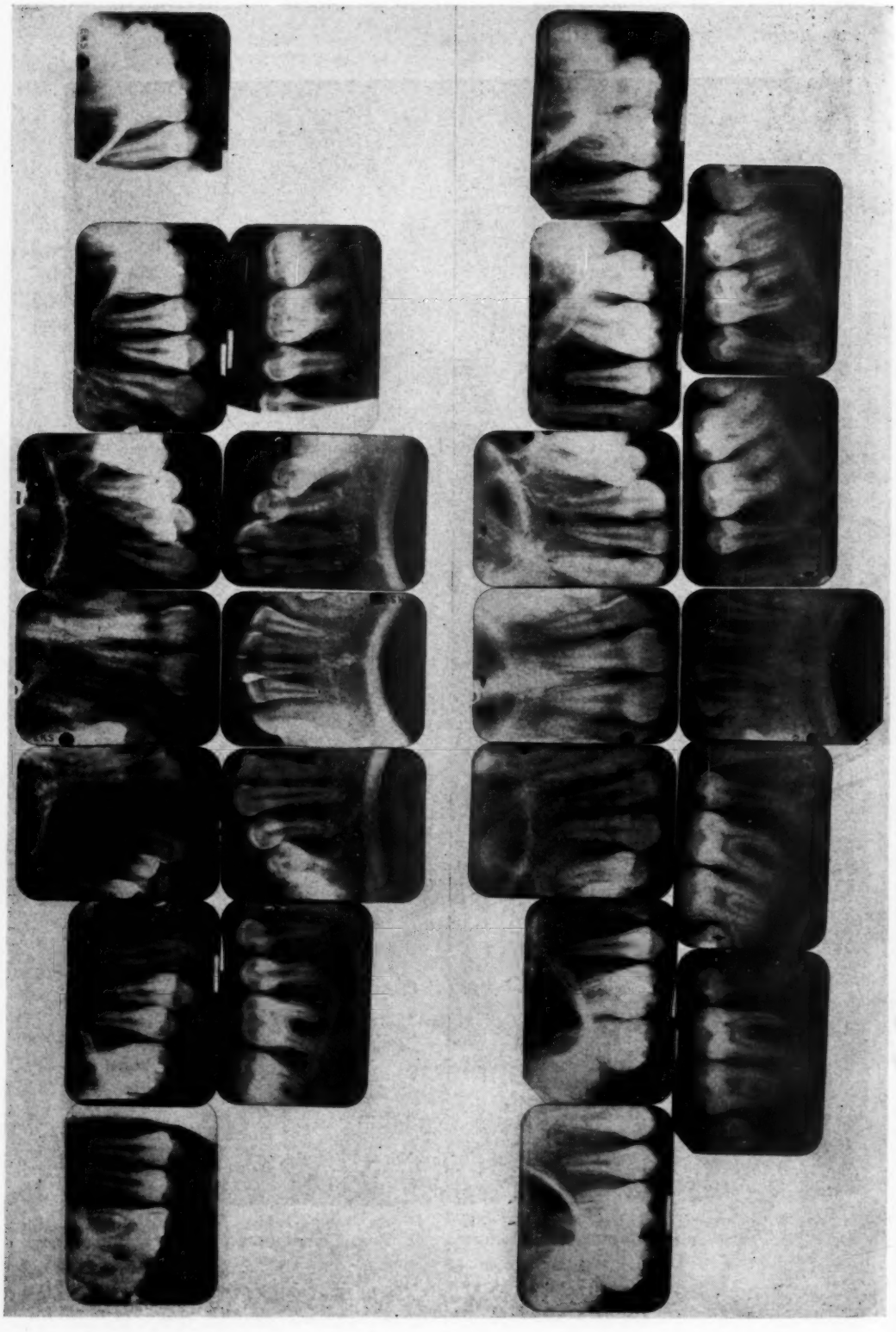


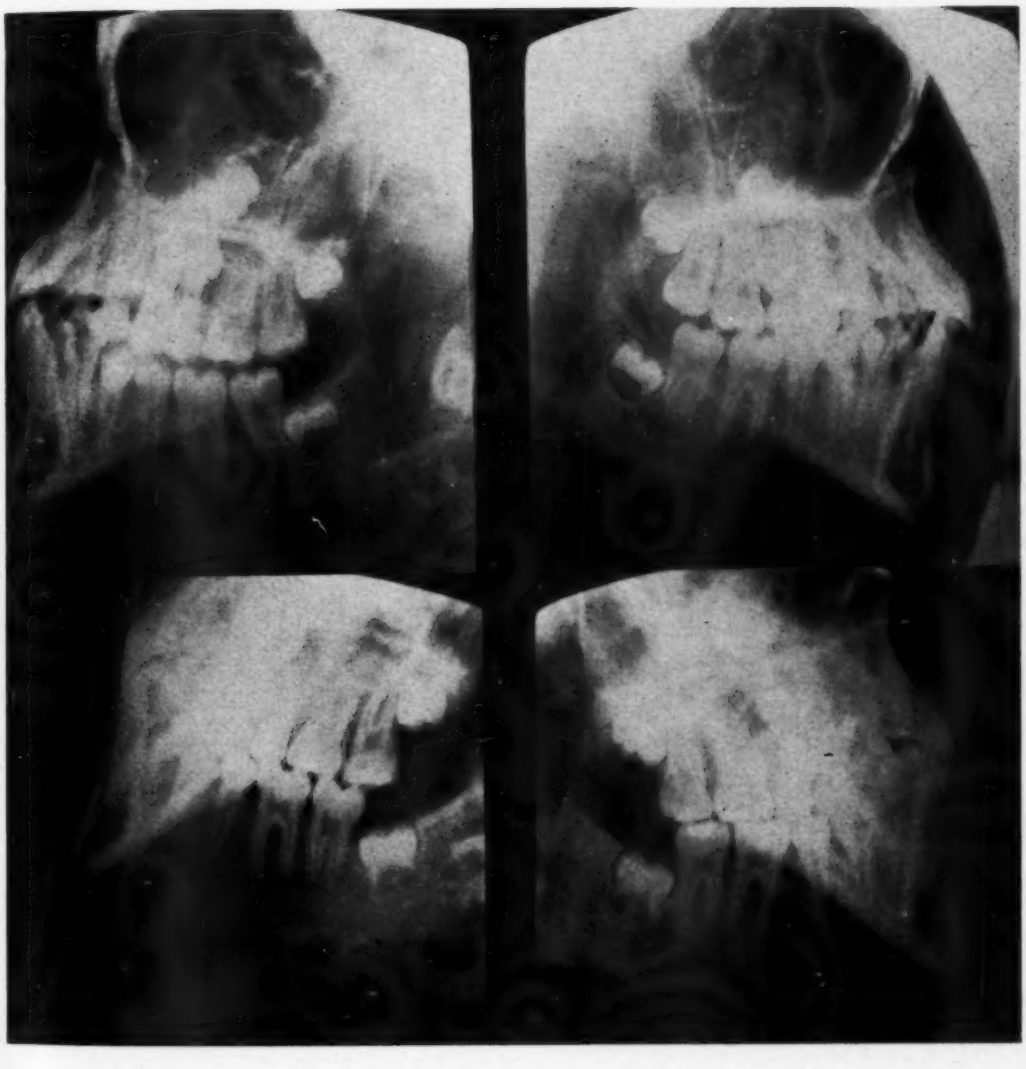
Fig. 3.—*A*, Front facial photograph before treatment. *B*, Profile photograph before treatment. *C*, Front facial photograph after treatment. *D*, Profile photograph after treatment.



A. B.

FIG. 4. (For legend see opposite page.)

C.



D.

Fig. 4.—*A*, Dental roentgenograms before treatment. *B*, Dental roentgenograms after treatment. *C*, Lateral jaw roentgenograms before treatment. *D*, Lateral jaw roentgenograms after treatment.

Fig. 4. (For legend see opposite page.)

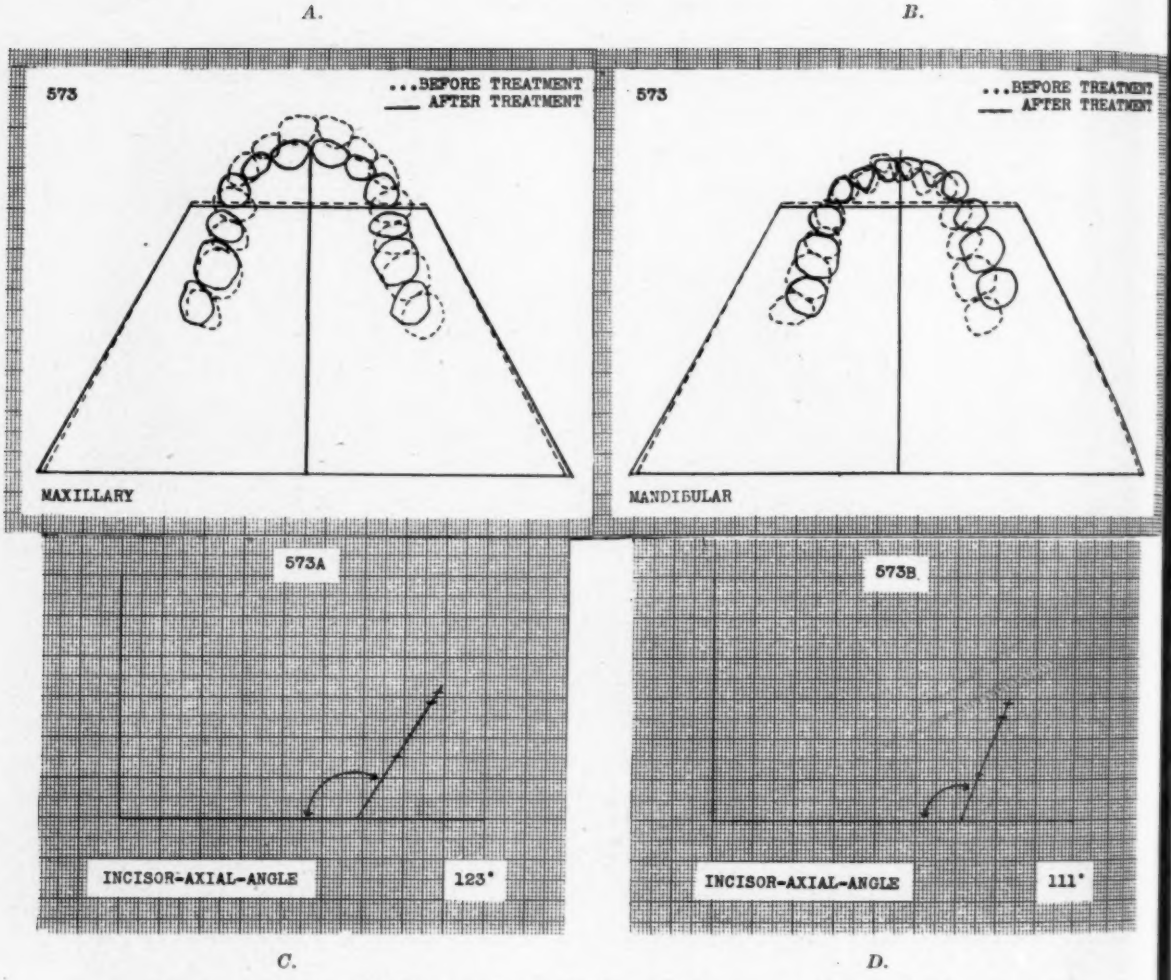


Fig. 5.—*A* and *B*, Maxillary and mandibular graphs representing projection of teeth on the Frankfort plane with reference to the preauricular and median planes before and after treatment. Dotted line, before treatment. Solid line, after treatment. *C* and *D*, Sagittal graphs obtained from the sectioned oriented dental casts showing the change in the incisor-axial angle. *C*, Before treatment. *D*, After treatment. *E*, Oriented mandibular roentgenogram after treatment.

111 degrees after treatment. The axial inclination of the mandibular incisors has been corrected by 12 degrees (Fig. 2, *G* and *H*) (Fig. 5, *C* and *D*).

4. *The Oriented Mandibular Roentgenogram.*—The incisor roots are well within alveolar bone. The crown-axis shows that the root is in a safe lingual position to the labial alveolar plate (Fig. 5, *E*).

Fig. 5, *E*. *(For legend see opposite page.)*

RETENTION

a. *Maxillary Arch.*—A Hawley retainer with a labial wire passed between the canines and lateral incisors and adapted to the labial surfaces of the maxillary incisors.

b. *Mandibular Arch.*—A Hawley retainer with first molar occlusal rests and a labial wire passed between the canines and lateral incisors and adapted to the labial surfaces of the mandibular incisors.

SUMMARY

In the case reported, four first premolars were extracted as part of the treatment plan. The following four factors were the basis for the decision to extract: (1) The fullness around the mouth. (2) The protrusive condition of the denture as indicated by a mandibular-incisor-axial angle of 123 degrees. (3) The crowded condition of the mandibular incisors. (4) The unfavorable condition of the lower third molars interfering with the posterior movement of the lower arch.

The use of oriented plaster casts, oriented photographs, and oriented mandibular roentgenograms made an appraisal of tooth movement possible. The records showed: (1) That in this case the spaces created by the extraction

OUTLINE OF MEANS FOR OBTAINING THE TOOTH MOVEMENT

The appliances used were the edgewise and the mechanics followed were those developed by Dr. Charles H. Tweed[5] and taught in this city by Dr. Robert W. Strang.[6]

Treatment Record.—

1943		
April	15	Treatment started.
June	12	The lower first bicuspids extracted.
June	22	The lower sectional arches inserted.
July	5	The upper first bicuspids extracted.
Aug.	19	The upper sectional arches inserted.
Sept.	28	The lower sectional arches replaced with a continuous 0.021 by 0.028 arch with rounded-off anterior segment.
Dec.	18	The upper sectional arches replaced with a continuous 0.018 round appliance.
1944		
Feb.	21	Replaced upper with 0.021 round looped appliance.
March	23	Replaced upper with 0.021 by 0.025 continuous appliance.
June	20	Replaced upper with 0.021 by 0.028 continuous appliance.
Aug.	8	Replaced upper and lower with new 0.021 by 0.028 arches with *midget vertical elastics.*
Oct.	11	Removed all lower appliances and impression taken for lower retainer.
Oct.	16	Inserted lower retainer.
Oct.	25	Removed all upper appliances and impression taken for upper retainer.
Nov.	1	Inserted upper retainer.

RESULTS OF ORTHODONTIC TREATMENT

Fig. 2, *B, E,* and *F* shows casts after treatment.
Fig. 2, *H* shows reduced incisor-axial angle.
Fig. 3, *C* shows front facial photograph after treatment.
Fig. 3, *D* shows profile photograph after treatment.
Fig. 4, *B* shows dental roentgenograms after treatment.
Fig. 4, *D* shows lateral jaw roentgenograms after treatment.

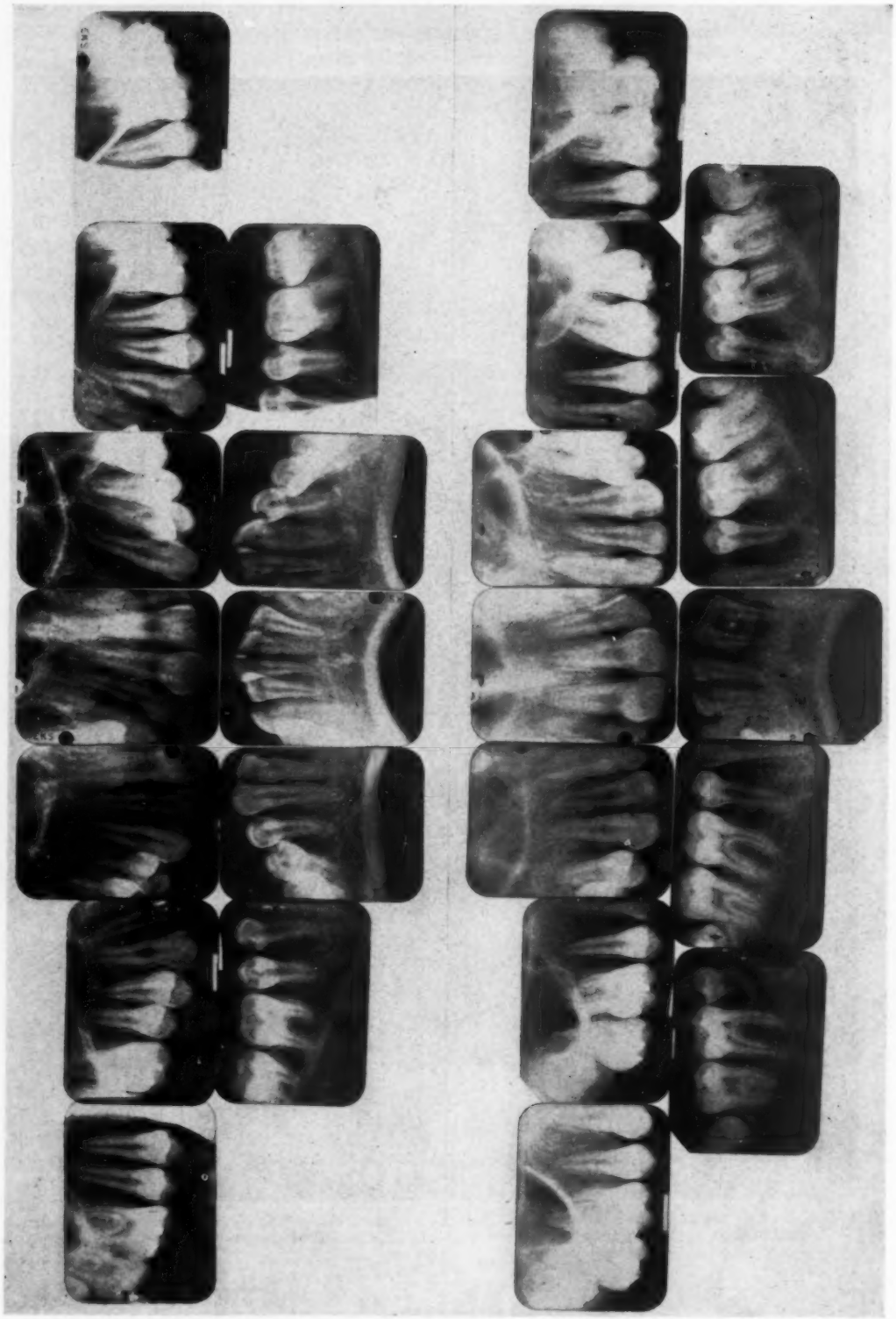
ANALYSIS OF TOOTH MOVEMENT

1. *From the Median Plane.*—(a) *Maxillary and mandibular* arches: The median line of the dental arch which was to the left of the median plane of the head before treatment coincides with this plane at the end of treatment (Fig. 5, *A* and *B*).

2. *From the Preauricular Plane.*—(a) *Maxillary arch:* the spaces of the extracted first premolars seem to have been taken up partially by the six anterior teeth which have moved distally into a wider area and partially by the premolars and molars having moved mesially (Fig. 5, *A*). (b) *Mandibular arch:* the same movement seems to have taken place in this arch (Fig. 5, *B*). The mesial movement of the premolars and molars has created additional space between the second molars and third molars as shown in the lateral jaw roentgenographic plates (Fig. 4, *D*).

3. *The Mandibular Incisor-Axial Angle.*—As shown in the sectioned casts and graphs, this angle has been reduced from 123 degrees before treatment to

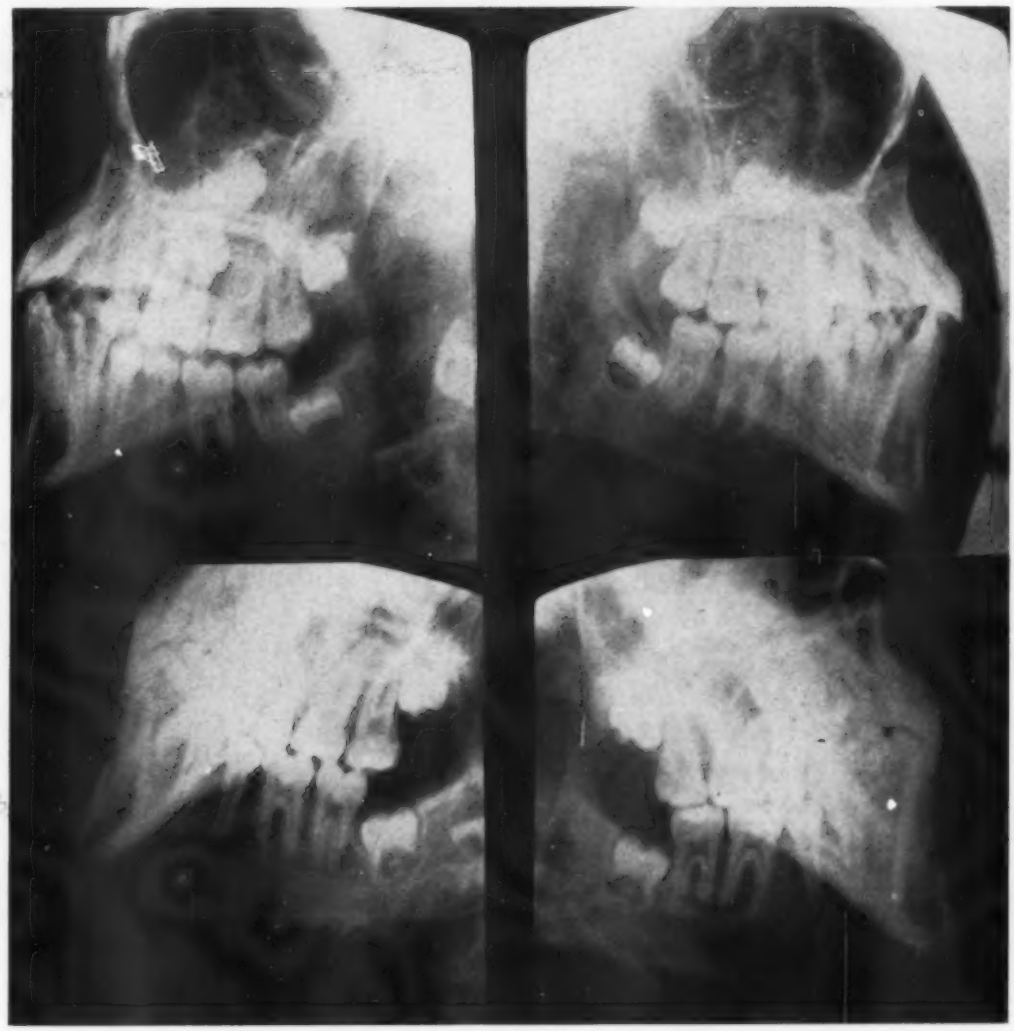
Fig. 3.—*A*, Front facial photograph before treatment. *B*, Profile photograph before treatment. *C*, Front facial photograph after treatment. *D*, Profile photograph after treatment.



A. *B.*

Fig. 4. (*For legend see opposite page.*)

C.



D.

Fig. 4.—*A*, Dental roentgenograms before treatment. *B*, Dental roentgenograms after treatment. *C*, Lateral jaw roentgenograms before treatment. *D*, Lateral jaw roentgenograms after treatment.

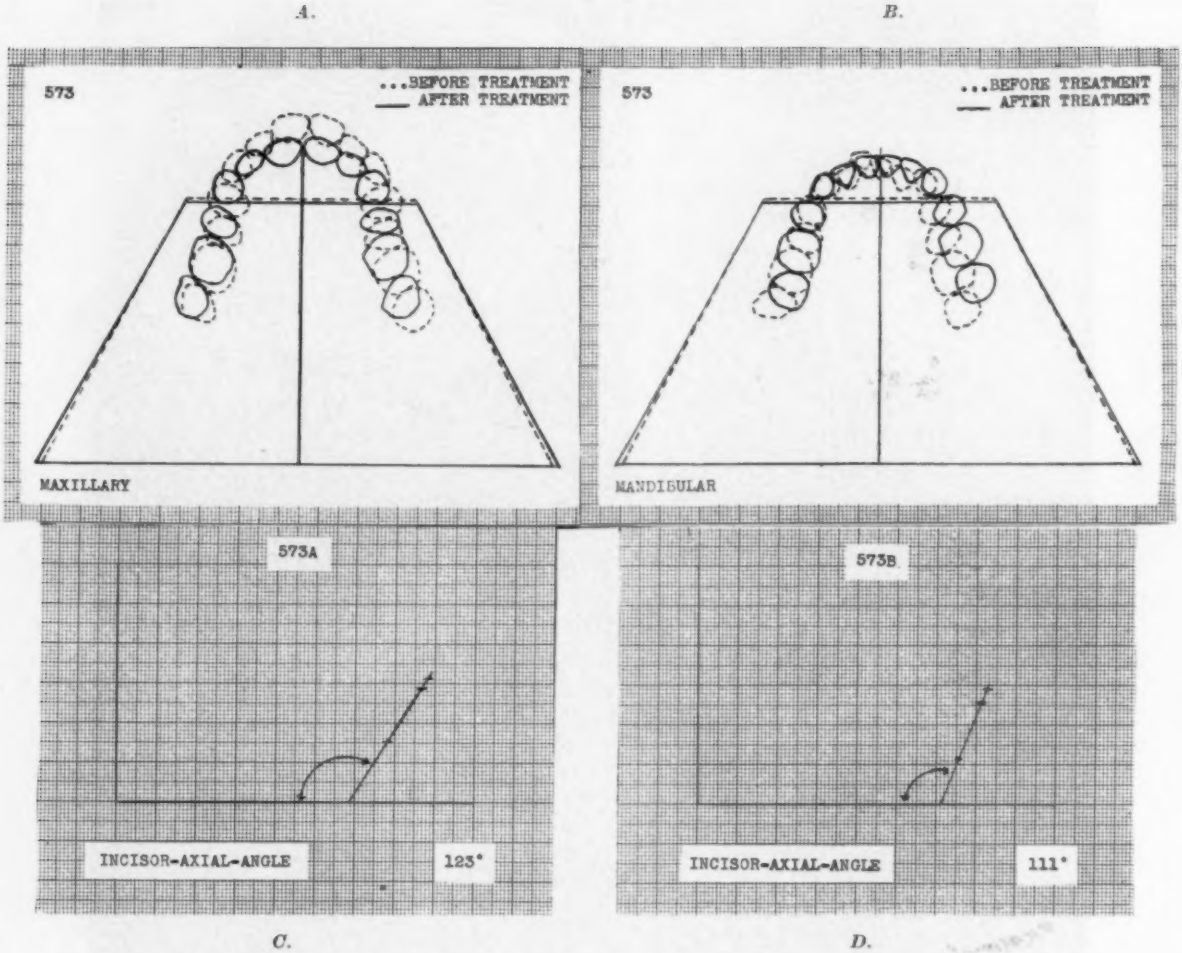


Fig. 5.—*A* and *B*, Maxillary and mandibular graphs representing projection of teeth on the Frankfort plane with reference to the preauricular and median planes before and after treatment. Dotted line, before treatment. Solid line, after treatment. *C* and *D*, Sagittal graphs obtained from the sectioned oriented dental casts showing the change in the incisor-axial angle. *C*, Before treatment. *D*, After treatment. *E*, Oriented mandibular roentgenogram after treatment.

111 degrees after treatment. The axial inclination of the mandibular incisors has been corrected by 12 degrees (Fig. 2, *G* and *H*) (Fig. 5, *C* and *D*).

4. *The Oriented Mandibular Roentgenogram.*—The incisor roots are well within alveolar bone. The crown-axis shows that the root is in a safe lingual position to the labial alveolar plate (Fig. 5, *E*).

Fig. 5, *E*. *(For legend see opposite page.)*

RETENTION

a. *Maxillary Arch.*—A Hawley retainer with a labial wire passed between the canines and lateral incisors and adapted to the labial surfaces of the maxillary incisors.

b. *Mandibular Arch.*—A Hawley retainer with first molar occlusal rests and a labial wire passed between the canines and lateral incisors and adapted to the labial surfaces of the mandibular incisors.

SUMMARY

In the case reported, four first premolars were extracted as part of the treatment plan. The following four factors were the basis for the decision to extract: (1) The fullness around the mouth. (2) The protrusive condition of the denture as indicated by a mandibular-incisor-axial angle of 123 degrees. (3) The crowded condition of the mandibular incisors. (4) The unfavorable condition of the lower third molars interfering with the posterior movement of the lower arch.

The use of oriented plaster casts, oriented photographs, and oriented mandibular roentgenograms made an appraisal of tooth movement possible. The records showed: (1) That in this case the spaces created by the extraction

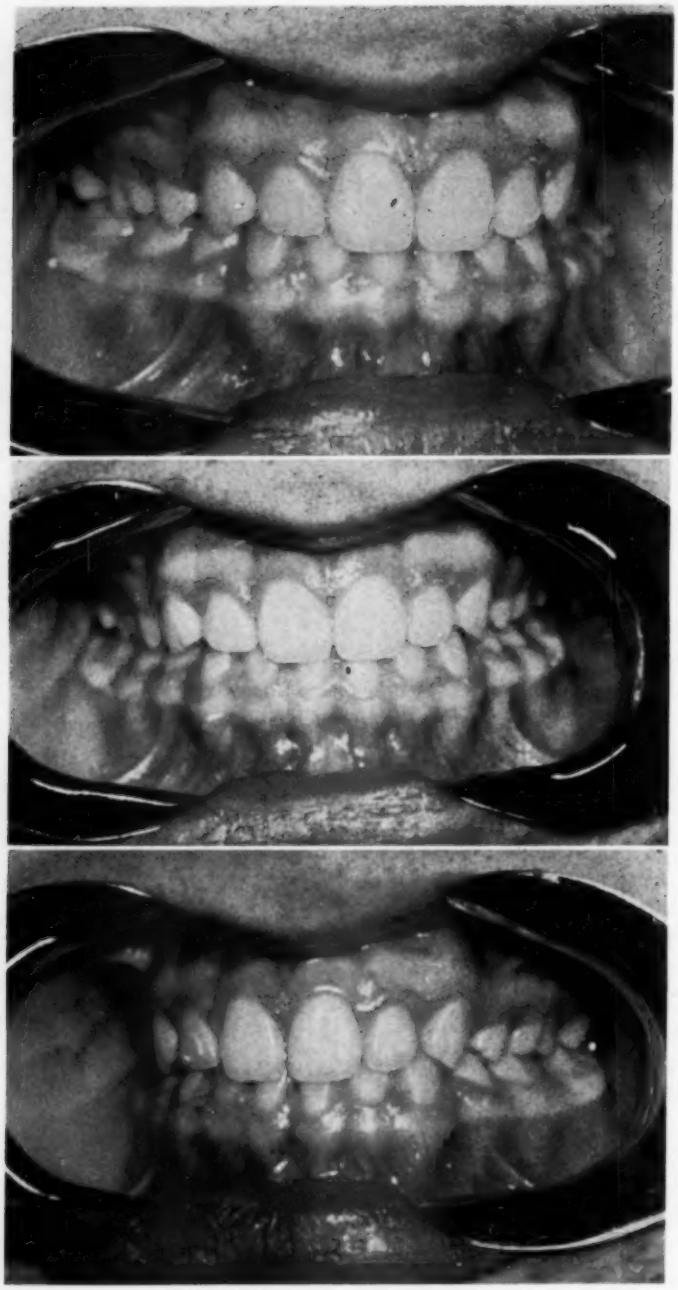


Fig. 6.—Dental photographs fourteen months after completion of treatment. *A*, Right view. *B*, Front view. *C*, Left view.

of the first premolars were taken up by the six anterior teeth moving posteriorly and laterally and the premolars and molars moving forward to meet them in the space. In this particular case this forward movement of the posterior teeth created additional space between the mandibular second molars and third molars. (2) There was a readjustment of the upper and lower arches so that the median line which was to the left of the median plane of the head before treatment coincided with this plane at the end of treatment. (3) The mandibular incisors were uprighted as shown by a reduction of 12 degrees of the angle formed by the incisors with the Frankfort plane. (4) The roots of the mandibular incisors at the end of treatment appeared well imbedded in bone in relation to the labial alveolar plate as shown in the oriented mandibular roentgenogram.

Fig. 6 shows dental photographs fourteen months after the completion of treatment.

REFERENCES

1. Fischer, Bercu: The Denti-Phore, AM. J. ORTHODONTICS AND ORAL SURG. 26: 941-954, 1940.
2. Idem: Orthodontic Photographic Recorder, AM. J. ORTHODONTICS AND ORAL SURG. 26: 139-148, 1940.
3. Idem: Recording the Frankfort-Mandibular-Plane Angle Using Oriented Mandibular Radiogram and Sectioned Oriented Cast, Angle Orthodontist 15: 30-36, 1945.
4. Kaletsky, Theodore: A Simple Way to Produce Consistently Accurate Intraoral Roentgenograms and a Modification of the Technic of Dental Roentgenography, J. Am. Dent. A. 26: 390-398, 1939.
5. Tweed, Charles H.: The Application of the Principles of the Edgewise Arch in the Treatment of Malocclusions, Angle Orthodontist 11: 5, 12, 1941.
6. Strang, R. H. W.: Text-Book of Orthodontia, Philadelphia, 1943, Lea & Febiger.

2 EAST 54TH STREET.

Honor Roll of Active Members
American Association of Orthodontists
Serving in the Armed Forces

Dr. Herman Adelstein
Cleveland, Ohio

Dr. C. A. Allenburger
New Orleans, La.

Dr. E. W. Anderson
Cedar Rapids, Iowa

Dr. Walter Appel
Cheyenne, Wyo.

Dr. Harvey G. Bean
Toronto, Ont., Can.

Dr. Henry C. Beebe
Boston, Mass.

Dr. George F. Bowden
Denver, Colo.

Dr. W. A. Buhner
St. Petersburg, Fla.

Dr. Harry Cimring
Los Angeles, Calif.

Dr. Allen Collins
Detroit, Mich.

Dr. R. Burke Coomer
Louisville, Ky.

Dr. Willard D. Crapo
Los Angeles, Calif.

Dr. Wm. B. Currie
Indianapolis, Ind.

Dr. George L. Englert
Camp Grant, Ill.

Dr. Frederick M. Epley
San Francisco, Calif.

Dr. Marion A. Flesher
Oklahoma City, Okla.

Dr. Laurence Furstman
Los Angeles, Calif.

Dr. Raymond Gillespie
Fort Knox, Ky.

Dr. Paul E. Gilliam
Houston, Texas

Dr. Dennis D. Glucksman
New York, N. Y.

Dr. R. T. Goldsmith
Houston, Texas

Dr. Harold S. Grohosky
Galveston, Texas

Dr. Murray M. Hall
Houston, Texas

Dr. Claude S. Jones
Johnson City, Tenn.

Dr. William R. Joule
Kearney, N. J.

Dr. Matthew M. Kaufman
New York, N. Y.

Dr. Frank J. Krivanek
Oak Park, Ill.

Dr. Harley G. Kushel
Rochester, N. Y.

Dr. Percy H. Lunn
Buffalo, N. Y.

Dr. Robert MacConkey
Rochester, N. Y.

Dr. Joseph L. McDowell
Ossining, N. Y.

Dr. John W. Makeig
Amarillo, Texas

Dr. Charles Mason
New York, N. Y.

Dr. Michael J. Maxian
New York, N. Y.

Dr. Herbert V. Muchnic
Los Angeles, Calif.

Dr. Marcus D. Murphey
Houston, Texas

Dr. G. W. Oglestone
Saginaw, Mich.

Dr. Reuben E. Olson
Wichita, Kansas

Dr. J. D. Peak
Austin, Texas

Dr. William Adams Pressly
Greensboro, N. C.

Dr. E. B. Pulliam
Corpus Christi, Texas

Dr. Joe Tennyson Reece
New York, N. Y.

Dr. John W. Richardson
Cleveland, Ohio

Dr. J. A. Rowe
San Antonio, Texas

Dr. Earl E. Shepard
St. Louis, Mo.

Dr. Carl H. Showalter
Santa Cruz, Calif.

Dr. Milton Siegel
Albany, N. Y.

Dr. Saul Simon
Toronto, Can.

Honor Roll of Active Members
American Association of Orthodontists
Serving in the Armed Forces

(Continued)

Dr. L. Scroggs Singleton
Los Angeles, Calif.

Dr. Arnold E. Stoller
Seattle, Wash.

Dr. Martin S. Strickler
Chicago, Ill.

Dr. Bernard F. Swain
Morristown, N. J.

Dr. Jack Taylor
Santa Monica, Calif.

Dr. Louis F. Tinthoff
Peoria, Ill.

Dr. M. A. Ukena
Marshalltown, Iowa

Dr. Alexander L. Ungar
New York, N. Y.

Dr. Ott L. Voigt
Waco, Texas

Dr. William F. Walsh
Stockton, Calif.

Dr. Robert L. Whitney
Pasadena, Calif.

Dr. Seymour L. Winslow
Santa Rosa, Calif.

Dr. S. H. Yoffe
Harrisburg, Pa.

Dr. Sidney Zeitz
Brooklyn, N. Y.

Regular Army Service Members

Col. Harry Deiber
Col. Neal Harper
Col. Wm. H. Siefert
Col. Richard F. Thompson
Col. L. B. Wright

There may be members in the Service whose names do not appear in the above list. These members should notify the secretary at once so that their names may be included.

Max E. Ernst, Secretary, American Association of Orthodontists, 1250 Lowry Medical Arts Bldg., St. Paul, Minn.

Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

The Recognition of Primary Hyperparathyroidism. An Analysis of Twenty-Four Cases: By F. Raymond Keating, Jr., M.D., and Edward N. Cook, M.D., *J. A. M. A.* **129:** 994-1002, Dec. 6, 1945.

In 1934 Albright and his associates at the Massachusetts General Hospital reported 17 proved cases of hyperparathyroidism, most of which they had observed during a period of two years. Analysis of these cases led them to conclude that: (1) hyperparathyroidism can occur without evident disease of bone; (2) involvement of the urinary tract is a more common and more important manifestation of hyperparathyroidism than involvement of the skeleton, (3) an etiological factor is the formation of renal calculi in an appreciable number of cases. Subsequent experience of this group of investigators has amply substantiated these conclusions.

Symptoms Associated With the Chemical Changes in the Blood.—Hyperparathyroidism is characterized by an increase of calcium and a reduction of inorganic phosphorus in serum. Symptoms occur which represent the antithesis of parathyroid tetany. Pronounced muscular atony is found, and with it, weakness, fatigue, and constipation. Anorexia, loss of weight, nausea and vomiting also are encountered. In many of the cases of advanced hyperparathyroidism with skeletal involvement reported in the literature, such general symptoms have been very severe.

In the patients having classic bone disease, general symptoms were severe in 3 cases and moderate or inconspicuous in the others. Conspicuous weakness, fatigue, nausea and vomiting occurred in 2 cases with minimal bone disease (Group 2); in 4 other cases of this group these symptoms were minimal, and in 3 cases entirely absent. Mild symptoms occurred in half of the patients without evident bone disease (Group 3). The foregoing symptoms could be correlated roughly with the degree of hypercalcemia.

Polyuria.—The excessive excretion of calcium and phosphorus in the urine, which is characteristic of hyperparathyroidism, may be accompanied at times by severe polyuria and polydipsia. At times these symptoms have been conspicuous enough to lead to an erroneous diagnosis of diabetes insipidus. Conspicuous polyuria and polydipsia occurred in 46 per cent of the cases, distributed evenly among the three groups.

Dental Roentgenograms.—The dental pathologic changes in hyperparathyroidism have been discussed by Borg, by Stafne, and Austin, and more recently by Strock. These writers have emphasized the fact that in a number of in-

Fig. 1.—Dental roentgenograms in hyperparathyroidism: *a*, Appearance of the mandible in 1939, one year before the first symptoms of hyperparathyroidism appeared; the osseous structure is normal and the lamina dura intact. *b*, The same case in 1944 prior to removal of a parathyroid adenoma; at this time typical generalized skeletal involvement was present; the mandible shows generalized demineralization, distortion of the bony architecture, and disappearance of the lamina dura. *c*, The same area in 1945, six months after removal of the parathyroid adenoma; the bone still shows abnormal structure but there has been visible recalcification and the lamina dura is reappearing. *d*, An example of more extensive dental changes encountered in another case; in addition to the changes described previously there is disappearance of the roots of the molar teeth as the result of encroachment of a cystic tumor in the mandible.

stances of hyperparathyroidism the presenting symptoms have been the result of changes in the oral cavity. Strock called attention to the frequency with which epulis and malocclusion occurred. He also emphasized the characteristic ground-glass osteroporosis and the loss of the lamina dura which was observed in the dental roentgenogram of such patients. No increase in dental caries has been observed in patients with parathyroid disease. Albright has emphasized the usefulness of the dental roentgenogram in the diagnosis of hyperparathyroidism and has particularly stressed the significance of the lamina dura.

Dental roentgenograms were made in 13 cases. The characteristic roentgenologic changes described by Strock were observed in all 4 of the cases in Group 1, and definite, although mild, changes were present in 2 of the 3 cases in Group 2. In 6 cases from Group 3, however, the dental roentgenograms, like those of the skeleton, were entirely normal. The most striking change in the roentgenograms of the jaws (Fig. 1) was pronounced and diffuse derangement of the normal osseous pattern associated with evident diffuse demineralization. There was complete disappearance of the lamina dura in the 2 most severe cases in Group 1 but only partial disappearance in the remainder. One case showed cyst formation.

Mild degrees of osteoporosis may be detected more readily in the dental roentgenograms than elsewhere because the teeth, the density of which is unaffected by hyperparathyroidism, serve as indexes of opacity. Since disappearance of the lamina dura is observed in several purely dental conditions, this criterion is significant only if associated with diffuse demineralization and obvious derangement of the bony architecture.

The 1945 Year Book of Dentistry. Edited by Lester Cahn, D.D.S.; George W. Wilson, D.D.S.; Carl W. Waldron, M.D., D.D.S.; Stanley D. Tylman, D.D.S., M.S.; George R. Moore, D.D.S., M.S. Consulting Editor, Howard C. Miller, D.D.S., LL.D. Price $3.00 Chicago, The Year Book Publishers, Inc., 1946.

Once again, the Year Book of Dentistry presents a digest on every phase of dental practice, based on articles that have appeared in medical and dental literature during the previous year. Even the voracious reader of dental magazines will find it worth while to add this volume to his reference library, because he will find here under one cover a digest by experienced editors of most of the significant articles on the newer developments in the profession. A new addition to the editorial staff of the Year Book is Dr. Lester Cahn, who replaces Dr. Charles G. Darlington as editor of the section on Diseases of the Mouth; Pathology and Dental Research. Dr. Cahn, who is well versed in this subject, is a happy choice to continue the work so capably performed in the past by Dr. Darlington.

Pain in dentistry is discussed in a digest of an article by Dr. Harry Sicher. This should prove of general interest. Root canal therapy is represented by a number of excellent reviews, as are the subjects of periodontia, radiodontia, and operative dentistry for children. The use of acrylics in operative dentistry comes in for its due share of discussion. Surgical treatment of periodontoclasia and chemotherapy in the treatment of jaw infections is included, and an extensive review is presented of facial wounds and fractures.

The subject of acrylics for denture work is discussed at great length. There is today no question of the permanence of this material as a denture base.

The section on orthodontics, edited by Dr. George Moore of Michigan, presents a wide coverage, ranging from etiology, under which we find discus-

sions of hereditary influences and the sequelae, to extraction in orthodontics. The latter is today of great importance in view of the inclusion of extraction as an adjunct to orthodontic therapy. Interesting articles have been included also on growth and development, diagnosis, and the prevention and interception of malocclusion. The social aspects of orthodontic care are discussed and should furnish much food for thought on the part of orthodontists.

As in the past we take great pleasure in heartily recommending this book to the student, the busy practitioner, and even to those who take the time and trouble to follow the ever-growing periodical dental literature as it appears.

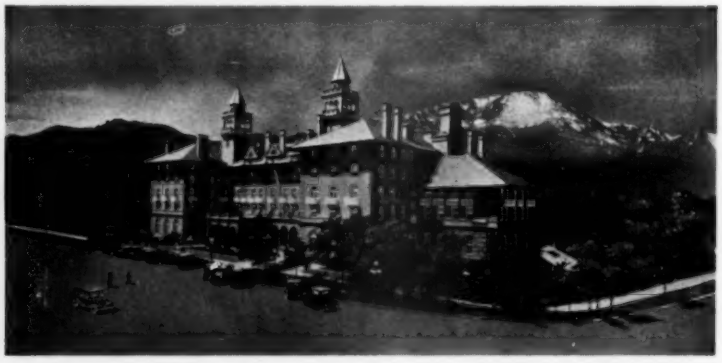
J. A. S.

News and Notes

American Association of Orthodontists

The next meeting of the American Association of Orthodontists will be held at the Broadmoor Hotel, Colorado Springs, Colorado, Sept. 30, Oct. 1, 2 and 3, 1946. Members of the American Dental Association are invited to attend this meeting. Proper credentials should be obtained in advance from the secretary of the American Association of Orthodontists or from the secretary of a constituent society.—MAX E. ERNST, Secretary, 1250 Lowry Medical Arts Bldg., St. Paul 2, Minn.

It has been announced that the Antlers Hotel, in Colorado Springs, Colorado, is in a position to take care of guests for the meeting of the American Association of Orthodontists who may be unable to secure accommodations at the Broadmoor, the headquarters hotel. Reservations should be made quite some time in advance.



The famous Antlers Hotel in Colorado Springs, Colorado, with Pike's Peak in the background. Here will be housed part of the membership of the American Association of Orthodontists during the meeting in Colorado Springs, Sept. 30, Oct. 1, 2, and 3, 1946.

American Board of Orthodontics

The 1946 meeting of the American Board of Orthodontics will be held at the Broadmoor Hotel, Colorado Springs, Colorado, Sept. 26, 27, 28, and 29, 1946. Orthodontists who may desire to be certificated by the Board may obtain application blanks from the Secretary, Dr. Bernard G. deVries, 705 Medical Arts Building, Minneapolis 2, Minnesota.

New York Society of Orthodontists

The next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, on Monday and Tuesday, Nov. 4 and 5, 1946.

Prize Essay Contest, American Association of Orthodontists

The Research Committee of the American Association of Orthodontists has been empowered by the Board of Directors to conduct a prize essay contest.

Eligibility.—Any student enrolled in a recognized university or any person who has completed his or her formal education in orthodontics not more than three years prior to June 1, 1946, is eligible to compete for the prize.

Essay.—The essay must represent a piece of original research having a direct bearing on the field of orthodontics. It may relate either to a biologic or clinical problem and may represent material that has been offered in partial fulfillment of the requirements of a graduate or postgraduate degree, or any graduate, postgraduate, or undergraduate contest. No papers previously submitted and now published or in press will be accepted for the present contest. All essays must be in the hands of the committee by June 30, 1946. If no essay is deemed worthy by the committee, the prize will be withheld.

Award.—The prize has been set at $200.00; in addition to this, the traveling expenses of the winning essayist to and from the meeting will be paid. The essay will be accorded a place on the scientific program of the annual meeting of the Association at Colorado Springs, Sept. 30, 1946, and the prize will be awarded at this time. The Association will retain publication rights on the first three choices.

For further information, address: ALLAN G. BRODIE, Chairman, Research Committee, A.A.O., 30 North Michigan Avenue, Chicago 2, Ill.

Membership Committee of American Dental Association

The Membership Committee of the American Dental Association for a long time has been concerned with the establishment of proper membership records in national, constituent, and component dental societies. The value of such a record system is obvious: It enables dental societies to have vital statistics on all dentists in their respective areas; it enables them to judge the effectiveness of their membership campaigns over a period of years; it enables them to tell immediately whether or not a dentist is a member and for how long a period that membership has been maintained.

The necessity for such a system of records in the national society has long been recognized by the Membership Committee. As a result of the Committee's proposal, the Central Office of the American Dental Association was recently authorized by the Board of Trustees to establish such a system at a cost of thirty thousand dollars. This record system will employ the latest scientific methods. In addition to easy accessibility and high visibility in providing the basic information, the new record system will use photography to provide a directory of all dentists in the United States. The basic information on every dentist, as found on his Procurement and Assignment questionnaire, will be transferred by photographic means to his individual, permanent record in the central office. Thus, records will be maintained for each dentist from graduation until retirement or death.

From these records, the Membership Committee will develop pertinent information leading to coordinated, organized and continuing membership campaigns for every area of the country.

Work on this program has already been initiated in the Central Office and will be completed as rapidly as conditions permit.

American Dental Association

A new method through which teeth can be used as an index for the identification of nearly all of the "unknown" dead of World War II was reported today by *The Journal of the American Dental Association.*

The system has been developed by Dr. Lloyd G. Welty, former lieutenant colonel in the Army Dental Corps, and Randall R. Glasgow, former Medical Administrative Corps

captain now on leave from International Business Machines Corporation. Both are residents of San Francisco.

It is based on a code for translating dental records into numbers which can be punched out at the rate of 400 an hour on automatic machine record cards.

The cards, in turn, can be screened by high-speed sorters at a rate of 500 per minute so that any individual record desired can be located mechanically in a matter of minutes.

Immediate application of the system in military service is possible because the military maintains the necessary conditions of the method—universal dental care and dental records—and uses serial numbers to identify each individual.

In sample tests with dental records of 4,000 servicemen, Drs. Welty and Glasgow reported they were able to isolate individual sets of dental characteristics without any indication of duplication or inaccuracy.

Drs. Welty and Glasgow have submitted their system to the War Department which is now engaged in locating and registering the graves of 274,000 soldiers killed overseas. It is the most gigantic problem of identification ever undertaken.

Drs. Welty and Glasgow do not claim that their system will permit identification of all unknown war dead but point out that if it is adopted by the Armed Services it would reduce to a very small percentage the number of bodies of soldiers and sailors which could not be positively identified.

Identification by teeth, the two men reported, could be made as universal as identification by fingerprints if complete dental records of civilians were maintained and codified in a central system such as now used for fingerprint records.

Chance of exact duplication of cards in the code system is all but impossible due to the almost infinite differences in teeth and dental work among individuals, they said.

Teeth have always provided the most permanent means of identification. Because of difficulty in tracing dental records, cases of identification by teeth heretofore have been isolated and largely dependent upon coincidence.

The Welty and Glasgow system eliminates this obstacle by providing a rapid means of screening thousands of records to isolate the one needed for identification.

In preparing their code, they used data on fillings, missing teeth, crowns, and bridge abutments. Each tooth was provided a coding possibility from 00 to 99. For the 32 teeth, this provides a mathematical variation of the astronomical figure of 103 plus 151 zeros.

Only those few persons with perfect teeth without fillings or other dental work, and those with full dentures are excluded in the code. Persons with perfect teeth are exceedingly rare. And it has been a common practice in the Armed Forces to stamp the name of the patient in each set of false teeth.

All individuals could be covered, they said, by including additional code data on such individual differences as the fissures and grooves of each tooth, arch of the palate, curvature of teeth, and structure of the jaws.

In all cases, positive identification would have to be made by a dentist. The system would impose no new work for dental officers, they pointed out. The dentist need have only a table of coding, and his records would be simpler than those used in his work at present.

The investigators suggested that their system of teeth identification could also be readily adopted by insurance companies for civilians. They wrote:

"Such positive identification as is provided by dental characteristics would save insurance companies thousands of dollars in costly litigation concerning identity of insured persons.

"With a dental examination and record added to the medical examination at present required by most insurance companies, with coding by policy numbers and with their customary use of machine records, insurers could readily adopt the identification system."

Drs. Welty and Glasgow also suggested that the system would be of great assistance in hazardous industries in identifying victims of violent deaths. Universal adoption of the system, they said, might eventually mean there would be no more unknown deaths.

Pacific Coast Society of Orthodontists

The Pacific Coast Society of Orthodontists will hold its next general meeting in San Francisco, California, February 20, 21, and 22, 1947.

J. CAMP DEAN, 1624 Franklin Building, Oakland, Calif., President.

Notes of Interest

Elmer F. Bay, D.D.S., wishes to announce the opening of his offices, Suite 216, Medical Arts Building, Omaha, Nebraska. Practice limited to orthodontics.

Dr. Wells A. Daniels, 293 Bridge Street, Springfield, Massachusetts, announces the association of Dr. John E. McNally in the practice of exodontia.

Lester H. Jasper, D.D.S., announces his association with Drs. H. M. Fisher and H. G. Fisher, Suite 731-733, Metropolitan Building, 508 N. Grand Avenue, St. Louis, Missouri. Practice limited to oral surgery.

Fredrick B. Lehman, D.D.S., announces the opening of his offices at 1126 Merchants National Bank Building, Cedar Rapids, Iowa. Practice limited to orthodontics.

Dr. Frederick B. Noyes and Dr. John R. Thompson, of Chicago, Illinois, announce their association in the practice of orthodontics.

On July 1, 1946, Dr. Harold J. Noyes will become dean of the School of Dentistry of the University of Oregon. His place in the practice will be assumed by Dr. Thompson.

Bernard C. Rogell, D.M.D., has returned from military service and announces the opening of his office in the Dowling Building, 6 Pleasant Street, Malden, Massachusetts. Practice limited to orthodontics.

Dr. Harold E. Sippel announces the removal of his office to 32 Linwood Avenue, Buffalo 9, New York. Practice limited to orthodontics.

Dr. William Zak, associate of Dr. Floyd E. Gibbon, announces the maintaining of his offices at 405 Linwood Avenue, Buffalo 9, New York. Practice limited to orthodontics.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY is the official publication for the American Association of Orthodontists and the following component societies. The editorial board of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY is composed of a representative of each one of the component societies of the American Association of Orthodontists.

American Association of Orthodontists

President, Archie B. Brusse - - - - - - - - - - - 1558 Humboldt St., Denver, Colo.
President-Elect, Earl G. Jones - - - - - - - - - - 185 East State St., Columbus, Ohio
Vice-President, Will G. Sheffer - - - - - - - - - Medico-Dental Bldg., San Jose, Calif.
Secretary-Treasurer, Max E. Ernst - - - 1250 Lowry Medical Arts Bldg., St. Paul, Minn.

Central Section of the American Association of Orthodontists

President, C. S. Foster - - - - - - - - - - - - 803 Dows Bldg., Cedar Rapids, Iowa
Secretary-Treasurer, L. B. Higley - - - - - - - - 705 S. Summit St., Iowa City, Iowa

Great Lakes Society of Orthodontists

President, Willard A. Gray - - - - - - - - - Medical Arts Bldg., Rochester, N. Y.
Secretary-Treasurer, C. Edward Martinek - - - - - - 661 Fisher Bldg., Detroit, Mich.

New York Society of Orthodontists

President, Glenn H. Whitson - - - - - - - - - - 80 Hanson Pl., Brooklyn, N. Y.
Secretary-Treasurer, Oscar Jacobson - - - - - - - - 35 W. 81st St., New York, N. Y.

Pacific Coast Society of Orthodontists

President, J. Camp Dean - - - - - - - - - - - - 1624 Franklin St., Oakland, Calif.
Secretary-Treasurer, Earl F. Lussier - - - - - - - 450 Sutter St., San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, Henry F. Hoffman - - - - - - - - - - 700 Majestic Bldg., Denver, Colo.
Secretary-Treasurer, George H. Siersma - - - - - - 1232 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, J. E. Brown - - - - - - - - Merchants National Bank Bldg., Mobile, Ala.
Secretary-Treasurer, Leland T. Daniel - - - - - - 407-8 Exchange Bldg., Orlando, Fla.

Southwestern Society of Orthodontists

President, Brooks Bell - - - - - - - - - - - - Medical Arts Bldg., Dallas, Texas
Secretary-Treasurer, James O. Bailey - - - - - - Hamilton Bldg., Wichita Falls, Texas

American Board of Orthodontics

President, Frederic T. Murlless, Jr. - - - - - - - 43 Farmington Ave., Hartford, Conn.
Vice-President, Joseph D. Eby - - - - - - - - - 121 E. 60th St., New York, N. Y.
Secretary, Bernard G. deVries - - - - - - - - Medical Arts Bldg., Minneapolis, Minn.
Treasurer, Oliver W. White - - - - - - - - - 213 David Whitney Bldg., Detroit, Mich.
James D. McCoy - - - - - - - - - 3839 Wilshire Blvd., Los Angeles, Calif.
Claude R. Wood - - - - - - - - - - Medical Arts Bldg., Knoxville, Tenn.
James A. Burrill - - - - - - - - - 25 E. Washington St., Chicago, Ill.

In the January issue each year, the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY will publish a list of all of the orthodontic societies in the world of which it has any record. In addition to this, it will publish the names and addresses of the officers of such societies.

INDEX TO ADVERTISERS

Please mention "American Journal of Orthodontics and Oral Surgery" when writing advertisers—It identifies you

Aderer, Inc., Julius ---------- 9

Baker & Co., Inc. ---------- 1

Books—War Victims ---------- 13

Bristol-Myers Company ---------- 4

Dee & Company, Thomas J. ------ ----------Second Cover

Dee & Company, Thomas J. ------- 3

Ney & Company, The J. M. ------- 5

Novocol Chemical Mfg. Co., Inc. -- 7

Rocky Mountain Metal Products Co. 8

United Division, Consolidated Engineering Corporation ---------- 6

White Dental Mfg. Co., S. S. ----- ----------Fourth Cover

Whitehall Pharmacal Company ---- 2

Williams Gold Refining Co., Inc. -- 14

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

LABIO-LINGUAL TECHNIC

By OREN A. OLIVER, RUSSELL E. IRISH, CLAUDE R. WOOD
430 Pages. — 278 Illustrations. — Price, $10.00

This new book defines and describes under the heading of "Labio-Lingual Technic," the use of the labial and lingual appliances in the treatment of malocclusions. The authors have put into concrete form a technic for the treatment of malocclusions that is sufficiently comprehensive to permit a step-by-step description of the introductory phases, construction, and use of the labial and lingual appliances.

THE C. V. MOSBY COMPANY — Publishers — St. Louis, Mo.

S·S·White PRECIOUS METAL WIRES for Arches and Springs

NO. 61 METALBA—Platinum Color

A high-grade, exceptionally strong, tough, springy wire. No. 61 Metalba is the highest grade orthodontic wire of our manufacture. It is high fusing, and maintains its high physical properties after soldering operations.

$3.20 per dwt.

GOLD PLATINUM—Gold Color

Gold Platinum Wire has been proving its merits for all types of arches and springs for more than a quarter century. It's easy working, strong, tough, springy, and doesn't "tire" or lose its elasticity while othodontic treatments are in progress.

$2.60 per dwt.

NO. 12 CLASP

A high grade wire with physical properties that rival closely those of the highest priced orthodontic wires. It's almost as strong as the strongest, moreover, it is very tough and elastic, and an exceptional arch wire.

$2.50 per dwt.

S. S. WHITE METALBA BRAND BAND MATERIAL

A high-fusing, non-tarnishing all precious metal, medium hard band material, costing little more than base metal products. It's easy working, tough, and has good strength—sufficient for all orthodontic purposes. Metalba Band Material requires no particular heat treatment. It is high fusing and gold solder of any fineness may be used with it.

$1.85 per dwt.

ALL MADE IN POPULAR GAGES AND WIDTHS

Prices subject to change without notice

THE S. S. WHITE DENTAL MFG. CO., 211 S. 12th STREET, PHILADELPHIA 5, PA.